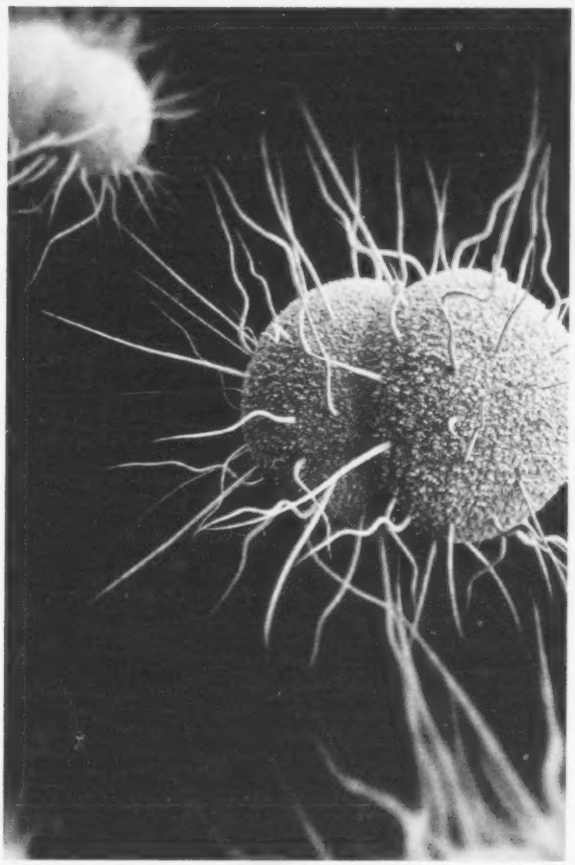
February 2, 2017 • Volume 43-2

CCDR

CANADA COMMUNICABLE DISEASE REPORT

SEXUALLY TRANSMITTED INFECTIONS



Research

Trends in prescribing for gonorrhea 33

Assessing the evidence base for HIV testing frequency 38

Survey

What do readers think about CCDR? 56

Links

Updated Zika Guidelines from CATMAT 60

Public Health Agency of Canada | Agence de la santé publique du Canada

Canada

CCDR
CANADA COMMUNICABLE DISEASE REPORT

The *Canada Communicable Disease Report* (CCDR) is a bilingual, peer-reviewed, open-access, online scientific journal published by the Public Health Agency of Canada (PHAC). It provides timely, authoritative and practical information on infectious diseases to clinicians, public health professionals, and policy-makers to inform policy, program development and practice.

Editorial Office

Editor-in-Chief
Patricia Huston, MD, MPH

Associate Editor
Hilary Robinson, MB ChB, MSc, FRCPC

Statistical Consultant
Dena Schanzer, PhD

Managing Editor
Mylène Poulin, BSc, BA

Production Editor
Wendy Patterson

Editorial Assistant
Jacob Amar

Copy Editors
Diane Finkle-Perazzo
Joanna Odrowaz

Photo Credit

Photo is an illustration that depicts a three-dimensional (3D) computer-generated image of drug-resistant *Neisseria gonorrhoeae* diplococcal bacteria. Produced by the U.S. Centers for Disease Control. Public Health Image Library. https://phil.cdc.gov/phil/home.asp.

CCDR Editorial Board

Michel Deilgat, CD, MD, MPA, CCPE
Centre for Foodborne, Environmental and Zoonotic Infectious Diseases
Public Health Agency of Canada

Sarah Funnell, MD, CCFP
Resident, Public Health and Preventive Medicine University of Ottawa

Jennifer Geduld, MHSc
Centre for Emergency Preparedness and Response
Public Health Agency of Canada

Judy Greig, RN, BSc, MSc
National Mircrobiology Laboratory
Public Health Agency of Canada

Maurica Maher, MSc, MD, FRCPC
Directorate of Force Health Protection
National Defence

Robert Pless, MD, MSc
Centre for Immunization and Respiratory Infectious Diseases
Public Health Agency of Canada

Ryan Regier, BA, MLIS
Office of the Chief Science Officer, Public Health Agency of Canada

Hilary Robinson, MB ChB, MSc, FRCPC
Centre for Public Health Infrastructure
Public Health Agency of Canada

Rob Stirling, MD, MSc, MHSc, FRCPC
Centre for Immunization and Respiratory Infectious Diseases
Public Health Agency of Canada

Jun Wu, PhD
Centre for Communicable Diseases and Infection Control
Public Health Agency of Canada

Contact Us

ccdr-rmtc@phac-aspc.gc.ca
613.301.9930

ISSN 1481-8531 Pub.150005

CCDR
CANADA COMMUNICABLE DISEASE REPORT

SEXUALLY TRANSMITTED INFECTIONS

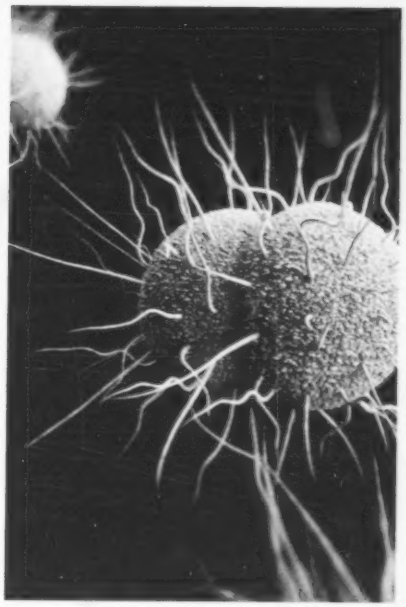


TABLE OF CONTENTS

RESEARCH

What are Canadian primary care physicians prescribing for the treatment of gonorrhea? 33

S Ha, L Pogany, J Seto, J Wu, M Gale-Rowe

SYSTEMATIC REVIEW

Evidence for optimal HIV testing intervals in HIV-negative individuals from various risk groups: a systematic review protocol 38

GP Traversy, T Austin, J Yau, K Timmerman

IMPLEMENTATION SCIENCE

Use of a 40-day rolling incidence to monitor pertussis in Nova Scotia, 2015 49

J Born, A Coombs, V Ryan, M LaFreniere, L Earle, S Fleming, A Fitzgerald, F Atherton

SURVEY

Canada Communicable Disease Report 2016 readership survey 56

P Huston, NM Farrell, L Townley

NOTICE

Interim Canadian Recommendations for the use of fractional dose of yellow fever vaccine during a vaccine shortage: Now in effect 59

ID NEWS

Recommendations on the prevention and treatment of Zika virus for Canadian health care professionals: 3rd Update 60

Use of motion comics for STI education 60

CORRECTIONS

Authors' corrections for Can Commun Dis Rep. 2016;42(11) 61

CCDR correction for Can Commun Dis Rep. 2017;43(1) 61

RESEARCH

What are Canadian primary care physicians prescribing for the treatment of gonorrhea?

S Ha[1], L Pogany[2], J Seto[3], J Wu[4], M Gale-Rowe[4]*

Abstract

Background: Cases of *Neisseria gonorrhea* are on the rise in Canada, which—if undetected or undertreated—can lead to morbidity and infertility. In addition, the number of antimicrobial resistant strains is also increasing creating the risk that *N. gonorrhea* may become untreatable. In 2013, the Public Health Agency of Canada (PHAC) released Canadian recommendations for the management and treatment of gonorrhea that identified the need for combination therapy to address and minimize antimicrobial resistance. However, the level of awareness and uptake of these guidelines is not well-known.

Objectives: To assess primary care physicians' prescribing practices for the management and treatment of gonorrhea.

Methods: After validity testing, two online cross-sectional surveys were conducted with a convenience sample of Canadian physicians. Physicians answered true/false statements and open-ended questions relating to three clinical scenarios: 1) suspected anogenital infection drawing from a population of men who have sex with men (MSM); 2) suspected anogenital infection drawing from a non-MSM population; and, 3) suspected pharyngeal infection drawing from any population. Frequencies of responses were calculated for the statements. Open-ended responses were recoded into treatment categories and frequencies were calculated for each scenario.

Results: A total of 625 physicians completed the survey. Most physicians (60%–95%) accurately identified knowledge statements regarding pharmaceutical management, partner notification and public health reporting. For all clinical scenarios, 30%–35% of physicians did not provide any treatment information, approximately 30% indicated treating with cephalosporin monotherapy, 20%–25% indicated they would prescribe a cephalosporin and azithromycin and a minority of physicians identified other treatment options. When physicians were asked about the purpose of the second antibiotic, azithromycin, 49% indicated it was to provide presumptive treatment for gonorrhea and chlamydia. Forty-one percent indicated it was to provide presumptive treatment for chlamydia only.

Conclusion: This convenience sample suggests that although knowledge of pharmaceutical management, partner notification, and public health reporting is high, the use of combination therapy to deter the development of antimicrobial resistant gonorrhea may not be widespread among primary care physicians. In light of both the growing incidence of *N. gonorrhea* and the rising rates of antimicrobial resistance in Canada, consideration on how to improve awareness and uptake of best prescribing practices in primary care may be indicated.

Affiliations

[1] Health Products and Food Branch, Health Canada, Ottawa, ON

[2] Regulatory Operations and Regions Branch, Health Canada, Ottawa, ON

[3] Global Affairs Canada, Ottawa, ON

[4] Centre for Communicable Diseases and Infection Control, Public Health Agency of Canada, Ottawa, ON

*** Correspondence:** margaret.gale-rowe@phac-aspc.gc.ca

Suggested citation: Ha S, Pogany L, Seto J, Wu J, Gale-Rowe M. What are Canadian primary care physicians prescribing for the treatment of gonorrhea? Can Commun Dis Rep. 2017;43(2):33-7.

Introduction

Gonococcal infection, caused by *Neisseria gonorrhea*, is a growing clinical and public health issue due to increasing rates, patterns of antimicrobial resistance and its association with long term health sequelae when left untreated or treated ineffectively. Among women, untreated gonorrhea is associated with pelvic inflammatory disease, ectopic pregnancy, or infertility; among men, it is associated with epididymitis or infertility (1,2). In Canada, reported cases of gonorrhea have increased by 38.9% between 2003 and 2012, with rates highest among 20–24-year-old men (148.5 per 100,000) and women (153.0 per 100,000) (3).

In addition to rising rates of gonorrhea, antimicrobial resistant *N. gonorrhea* has been increasing (4) including strains resistant to ceftriaxone (5). The Government of Canada has identified antimicrobial resistance as a priority area for action, and in 2013, the Public Health Agency of Canada (PHAC) released updated recommendations for the treatment of gonorrhea in their *Canadian Guidelines on Sexually Transmitted Infections*. These guidelines recommend combination antibiotic therapy, with the choice of medications varying by population and site of infection (6,7) (**Table 1**). Combination antibiotic therapy is recommended as the preferred therapy. It provides treatment with antibiotics acting through two different mechanisms which reduces the likelihood of treatment failure, addresses the emergence of

multi-drug resistant gonorrhea, and provides effective treatment for chlamydia (8-12). However, other guidelines are available and may inform the practice of primary care physicians.

Table 1: *Canadian Guidelines on Sexually Transmitted Infections 2013* recommendations for the treatment of uncomplicated gonorrhea

Scenario	Preferred therapy	Alternate therapy
Non-MSM adults and youth (> 9 years of age) with uncomplicated anogenital infection	Ceftriaxone 250mg IM PLUS azithromycin 1g PO OR Cefixime 800mg PLUS azithromycin 1g PO	Spectinomycin 2g IM PLUS azithromycin 1g OR Azithromycin 2g PO
Non-MSM adults and youth (> 9 years of age) with uncomplicated pharyngeal infection	Ceftriaxone 250mg IM PLUS azithromycin 1g PO	Cefixime 800mg PO PLUS azithromycin 1g PO OR Azithromycin 2g PO
Men who have sex with men (MSM) with uncomplicated anogenital infection	Ceftriaxone 250 mg intramuscularly (IM) PLUS azithromycin 1g orally (PO)	Cefixime 800mg PO PLUS azithromycin 1g PO OR Spectinomycin 2g IM PLUS azithromycin 1g PO OR Azithromycin 2g PO
MSM with uncomplicated pharyngeal infection	Ceftriaxone 250mg IM PLUS azithromycin 1g PO	Cefixime 800mg PO PLUS azithromycin 1g PO

Abbreviations: MSM, Men who have sex with men; IM, intra muscular; PO, per os (by mouth)

Findings from Canadian sexual health clinics suggest that combination therapy is prescribed at least 76% of the time (13), however, there is a paucity of evidence documenting primary care physicians' prescribing practices. Primary care health professionals have an important role in the prevention and management of antimicrobial resistant gonorrhea.

The objectives of the study were to describe primary care physicians' knowledge related to the management of antimicrobial resistant (AMR) gonorrhea and to identify their prescribing preference for three clinical scenarios.

Methods

Survey

PHAC commissioned two online cross-sectional surveys from an online survey company who recruits physicians across Canada who agree to be contacted for surveys. In April 2014 and March 2015, participating physicians were invited to take a 20-minute online survey with both open- and closed-ended questions. Survey questions were derived from previously developed questionnaires and were tested for face validity with PHAC nurses, physicians and epidemiologists. Physicians were asked to answer 14 true/false statements regarding the epidemiology, diagnosis, management and public health reporting of AMR gonorrhea. Open-ended responses for three clinical scenarios were solicited: 1) Suspected anogenital infection drawing from a population of MSM; 2) suspected anogenital infection drawing from a non-MSM population; and 3) suspected pharyngeal infection drawing from any population. Physicians received a financial incentive for completing the survey.

In 2015, a question was added to clarify physicians' reasons for prescribing the second antibiotic, azithromycin, for the treatment of gonorrhea.

Data analysis

Data were analyzed using SAS EG (v5.1). Pearson's chi-square test was used to compare the two samples. The datasets from both survey cycles were combined for analysis because no differences were found between the sample populations. The frequency of correct responses was calculated for each of the true/false statements on the diagnosis, treatment, follow-up and public health reporting of gonorrhea. The open-ended responses for the three clinical scenarios were recoded into the following treatment options: ceftriaxone and azithromycin; cefixime and azithromycin; cephalosporin alone; azithromycin alone; spectinomycin with azithromycin and other pharmaceutical regimens. Dosing information and route of administration were not considered due to large amounts of missing data. Physicians who indicated "not applicable", "do not treat men", "not sure", or "don't know" were grouped under "no treatment information".

Results

A total of 2500 physicians were contacted for the first survey and 321 completed the survey for a response rate of 13%. A total of 3600 physicians were contacted for the second survey and 304 completed the survey for a response rate of eight percent. A total of 625 physicians completed the two surveys.

Physicians' demographics and characteristics

Two thirds of respondents were male (66%), 83% of physicians had 10 or more years of practice and 85% worked in family medicine. Almost 75% of respondents encountered at least one case of gonorrhea in the previous year (**Table 2**).

Table 2: Socio-demographic characteristics of respondents (N=625)

Characteristic	N	(%)
Sex		
Female	208	33%
Male	410	66%
Prefer not to disclose	7	1%
Years of practice (years)		
Less than 10	109	17%
10 or more	516	83%
Profession		
Family medicine	532	85%
Obstetrics/gynecology	60	10%
Emergency medicine	21	3%
Other	12	2%
Practice setting[1]		
General/family practice	502	80%
Community health centre	73	12%
Walk-in clinic/urgent care	206	33%
Sexual health clinic	67	11%

Table 2: Socio-demographic characteristics of respondents (N=625) (continued)

Characteristic	N	(%)
Practice setting (continued)[1]		
Student health services	31	5%
Emergency	26	4%
Obstetrics/gynecology clinic	14	2%
Other	36	6%
Number of cases of gonorrhea encountered in the past year		
0	153	25%
1	90	14%
2 – 4	169	27%
5 – 9	97	16%
10+	104	17%
Not sure/no response	12	2%

Abbreviations: N, Number; %, percentage
[1] Percentages do not add to 100% as physicians may practice in more than one setting. Denominator is the total sample size

Knowledge related to the management of antimicrobial resistant gonorrhea

Overall, 60% to 95% of physicians accurately identified knowledge statements regarding pharmaceutical management, partner notification and public health reporting. Approximately two thirds of the respondents accurately identified statements related to current trends in rising incidence, the most common age groups affected and the presence of antimicrobial resistant gonorrhea in Canada (Table 3). Most respondents (87%) identified the importance of co-treatment for chlamydia.

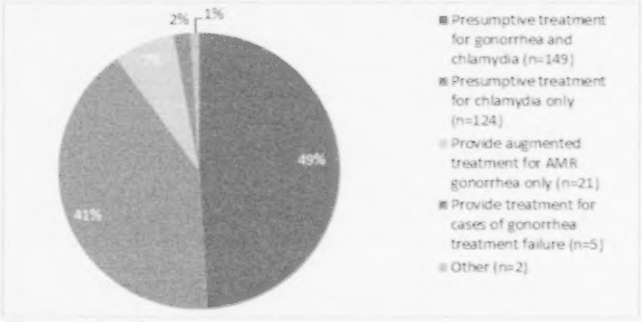
Table 3: Knowledge statements for the public health management of antimicrobial resistant gonorrhea

Area assessed	Knowledge statement	N (%) correct
Epidemiology	The number of reported cases of gonorrhea infection has decreased in the last decade or so. (True)	384 (61%)
	Antibiotic resistant gonorrhea is not a problem in Canada. (False)	400 (64%)
	Gonorrhea is the most commonly found in 30–40 year old females. (False)	316 (51%)
Diagnostic testing	Follow-up test of cure should be completed on all cases of diagnosed gonorrhea if possible. (True)	445 (71%)
	Cultures are particularly important for MSM who are symptomatic. (True)	413 (66%)
	When gonorrhea infection is suspected, samples should be taken from symptomatic patients and sent for both cultures and NAAT. (True)	350 (56%)
	Patients who fail treatment should have repeated NAAT testing. (False)	82 (13%)
Pharmaceutical management	Co-treatment for chlamydia is advisable when treating for gonorrhea. (True)	542 (87%)
	It is necessary to wait for culture results prior to antibiotic treatment of gonorrhea cases. (False)	492 (79%)
	Patients presenting with gonorrhea should be treated with a combination therapy. (True)	374 (60%)
Partner notification	It is important to do partner notification back to 60 days in all cases of diagnosed gonorrhea. (True)	542 (87%)
	Public health units can help physicians do partner notification. (True)	593 (95%)
Public Health Reporting	Gonorrhea is a reportable infection. Local public health authorities should be promptly notified. (True)	595 (95%)
	Gonorrhea is not a reportable infection in Canada. (False)	463 (74%)

Abbreviations: MSM, Men who have sex with men; NAAT, Nucleic Acid Amplification Test; N, Number; %, percentage

An additional question on the reason for prescribing a second antibiotic was added in the 2015 survey, and 49% identified it was for presumptive treatment for both gonorrhea and chlamydia and 41% identified it was for presumptive treatment for chlamydia (**Figure 1**).

Figure 1: Family physicians' reasons for prescribing the second antibiotic for the treatment of gonorrhea (2015)


2%
1%
49%
41%
Presumptive treatment for gonorrhea and chlamydia (n=149)
Presumptive treatment for chlamydia only (n=124)
Provide augmented treatment for AMR gonorrhea only (n=21)
Provide treatment for cases of gonorrhea treatment failure (n=5)
Other (n=2)

Abbreviation: n, number

Physicians' prescribing practices

Table 4 summarizes the data for prescribing practices. For all clinical scenarios, 30%–35% of physicians did not provide any treatment information, approximately 30% of physicians indicated treating with cephalosporin monotherapy, 20%–25% indicated they would prescribe a cephalosporin and azithromycin; and a minority of physicians identified other treatment options.

As regards to MSM patients presenting with suspected anogenital infection, almost 30% of physicians did not identify any treatment options, almost 30% indicated they would prescribe cephalosporin alone, 25% indicated they would prescribe a cephalosporin and azithromycin, five percent identified azithromycin alone and the rest identified other treatment options. With respect to non-MSM patients presenting with uncomplicated gonorrhea anogenital infection, 30% of physicians reported using cephalosporin monotherapy, 25% reported combination therapy with a cephalosporin and azithromycin; eight percent indicated treating with azithromycin alone and 13% reported using other antibiotic regimens. For the treatment of patients with pharyngeal infection, slightly over

30% of physicians did not identify a treatment, 27% identified cephalosporin monotherapy, almost 20% identified combination therapy with a cephalosporin and azithromycin and 15% of physicians reported using other pharmaceutical management strategies.

Table 4: Physicians' intent to prescribe for three clinical scenarios

Reported treatment choices	MSM anogenital n (%)	Non-MSM anogenital n (%)	Pharyngeal infection n (%)
Ceftriaxone + Azithromycin	81 (13.0%)[1]	74 (11.8%)[1]	68 (10.9%)[1]
Cefixime + Azithromycin	72 (11.5%)[2]	84 (13.4%)[1]	53 (8.5%)[2]
Azithromycin	34 (5.4%)[2]	50 (8.0%)[2]	53 (8.5%)[2]
Spectinomycin + Azithromycin	0 (0.0%)[2]	0 (0.0%)[2]	0 (0.0%)
Cephalosporin only[1]	179 (28.6%)	186 (29.8%)	167 (26.7%)
Other[2]	82 (13.1%)	84 (13.4%)	93 (14.9%)
No treatment information	177 (28.3%)	147 (23.5%)	191 (30.6%)

Abbreviations: MSM, Men who have sex with men; n, number; %, percentage
[1] Cephalosporins include cefixime, cefuroxime, or ceftriaxone
[2] Other treatments reported include ciprofloxacin, penicillin, amoxicillin, doxycycline, ofloxacin

Discussion

These online surveys found that participating physicians were knowledgeable about the pharmaceutical management, partner notification, and public health reporting of *N. gonorrhea*, but appeared to be less knowledgeable about the use of combination therapy to deter the development of antimicrobial resistant gonorrhea. Approximately 25% reported their intent to prescribe the specific combination therapy for anogenital infection identified by the *Canadian Guidelines on Sexually Transmitted Infections* as the preferred therapy to prevent treatment failure and to mitigate the development of antimicrobial resistance. Responding physicians appeared to be less confident in prescribing for pharyngeal gonorrhea. These findings are in contrast to studies of sexual health clinics, where prescribing combination therapy is routine (14-17).

Monotherapy for the treatment of gonorrhea is not recommended as treatment failures with oral cefixime monotherapy have been documented in Canada (12,18,19). In our sample, approximately 30% of physicians indicated they would treat gonorrhea with a cephalosporin monotherapy; however, close to half of physicians reported the purpose of the second antibiotic (often azithromycin) was for chlamydia only (and not gonorrhea) and 87% believed that co-treatment for chlamydia is advisable when treating for gonorrhea. As such, it is hypothesized that primary care physicians may be prescribing combination therapy, but largely to cover possible co-infection.

There are some limitations to consider. The response rate was very low and this convenience sample may not be representative of primary care physicians in Canada. In addition, a few of the questions may not have been clear and physicians' answers to epidemiological or diagnostic statements may have been consistent with their local epidemiology and guidelines, but not with national statistics or the *Canadian Guidelines on Sexually Transmitted Infections*.

Conclusion

In light of the rising incidence of gonorrhea and AMR gonorrhea, increasing awareness and uptake by primary care physicians of the routine use of combination therapy may help minimize treatment failure and deter the development of AMR gonorrhea.

Acknowledgements

We would like to thank the Expert Working Group for the *Canadian Guidelines on Sexually Transmitted Infections* for their contributions.

Conflict of interest

None.

Funding

This work was supported by the Public Health Agency of Canada. The authors have no external sources of funding to declare.

References

1. Creighton S. Gonorrhea. Am Fam Physician. 2012;85(6):642–643.
2. Miller K. Diagnosis and treatment of Nessieria gonorrhoeae infections. Am Fam Physician. 2006;73(10):1779.
3. Totten S, MacLean R, Payne E. Gonorrhea in Canada: 2003–2012. Can Comm Dis Rep. 2015;41(2). Available from: http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/15vol41/dr-rm41-02/surv-2-eng.php.
4. Ebrahim M, Gravel D, Thabet C, Abdesselam K, Paramalingam S, Hyson C. Antimicrobial use and antimicrobial resistance trends in Canada: 2014. Can Comm Dis Rep. 2016;42(11):227-31. Available from: http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/16vol42/dr-rm42-11/ar-02-eng.php.
5. Martin I, Sawatzky P, Liu G, Mulvey M. Antimicrobial resistance to Neisseria gonorrhoeae in Canada: 2009–2013. Can Comm Dis Rep. 2015;41(2). Available from: http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/15vol41/dr-rm41-02/surv-4-eng.php.
6. Public Health Agency of Canada. Canadian Guidelines on Sexually Transmitted Infections - Gonococcal Infections Chapter [Internet]. Ottawa: PHAC; 2013 [updated 2014 Sep 26; cited 2016 May 3]. Available from: http://www.phac-aspc.gc.ca/std-mts/sti-its/cgsti-ldcits/section-5-6-eng.php.
7. Pogany L, Romanowski B, Robinson J, Gale-Rowe M, Latham-Carmanico C, Weir C. Management of gonococcal infection among adults and youth. Can Fam Physician. 2015;61(10):869.
8. Centers for Disease Control and Prevention. Update to CDC's sexually transmitted diseases treatment guidelines, 2010: oral cephalosporins no longer a recommended treatment for gonococcal infections. MMWR. 2015;61(31):590.
9. Furuya R, Koga Y, Irie S, Ikeda F, Kanayama A, Kobayashi I. In vitro activities of antimicrobial combinations against clinical

isolates of Neisseria gonorrhoeae. J Infect Chemother. 2013;19(6):1218.

10. Hottes T, Lester R, Hoang L, McKay R, Imperial M, Gilbert M. Cephalosporin and azithromycin susceptibility in Neisseria gonorrhoeae isolates by site of infection, British Columbia, 2006 to 2011. Sexually Transm Dis. 2013;40(1):46.
11. Pereira R, Cole M, Ison C. Combination therapy for gonorrhoea: In vitro synergy testing. J Antimicrob Chemother. 2013;68(3):640.
12. Schumacher C, Ghanem K. Retreatment rates for uncomplicated gonorrhea infection: comparing ceftriaxone and azithromycin versus ceftriaxone and doxycycline. Sexually Transm Dis. 2013;40(7):539.
13. Singh AE Gratrix J, Martin I, Friedman D, Hoang L, Lester R, Metz G, et al. Gonorrhea treatment failures with oral and injectable expanded spectrum cephalosporin monotherapy vs. dual therapy at 4 Canadian sexually transmitted infection clinics, 2010-2013. Sexually Transm Dis. 2015;42(6).
14. Gratrix J, Bergman J, Anderson N, Read R, Singh A, Smyczek P [Internet]. Adherence to new treatment guidelines for uncomplicated anogenital and pharyngeal Neisseria Gonorrhea cases in adults in Alberta, Canada. Meeting of the Infectious Diseases Society of America. 2014 [cited 2016 Dec 24]. Available from: https://www.researchgate.net/publication/267881937_Adherence_to_New_Treatment_Guidelines_for_Uncomplicated_Ano-genital_and_Pharyngeal_Neisseria_Gonorrhea_Cases_in_Adults_in_Alberta_Canada.
15. Lechtenberg R, Samuel M, Bernstein K, Lahiff M, Olson N, Bauer H. Variation in adherence to the treatment guidelines for Neisseria gonorrhoeae by clinical practice setting, California, 2009 to 2011. Sexually Transm Dis. 2014;42(6):331.
16. The Eastern European Sexual and Reproductive Health (EE SRH) Network Antimicrobial Resistance Group. Recommended antimicrobial treatment of uncomplicated gonorrhoea in 2009 in 11 East European countries: implementation of a Neisseria gonorrhoeae antimicrobial susceptibility programme in this region is crucial. Sexually Transm Infect. 2010;86:442.
17. Roxanne K, Stenger M, Weinstock H, Berstein K, Reed M, Schumacher C. Gonorrhea treatment practices in the STD Surveillance Network, 2010-2012. Sexually Transm Dis. 2015;42(1):6.
18. Wetten S, Mohammed H, Yung M, Mercer C, Cassell J, Hughes G. Diagnosis and treatment of chlamydia and gonorrhoea in general practice in England 2000-2011: a population-based study using data from the UK clinical practice research datalink. BMJ Open. 2015.
19. Allen V, Mitterni L, Seah C, Anuradha R, Martin I, Lee C. Neisseria gonorrhoeae treatment failure and susceptibility to cefixime in Toronto, Canada. JAMA. 2013;309(2):163.

Canadian Guidelines on
Sexually Transmitted Infections

Mobile App Now Available

Quick and convenient access to up-to-date **Canadian guidelines** on the **diagnosis** and **management** of **STIs**.

Download It Today

Free Download

App Store Google Play

Search "Canadian Guidelines on Sexually Transmitted Infections"

Public Health Agency of Canada / Agence de la santé publique du Canada

Canada

Evidence for optimal HIV testing intervals in HIV-negative individuals from various risk groups: a systematic review protocol

GP Traversy[1], T Austin[1], J Yau[1], K Timmerman[1]*

Affiliation

[1] Centre for Communicable Diseases and Infection Control, Public Health Agency of Canada, Ottawa, ON

*** Correspondence:** karen.timmerman@phac-aspc.gc.ca

Abstract

Background: Evidence-based recommendations for HIV testing are essential for health care providers. However, it is unclear whether there is sufficient evidence to support recommendations for HIV testing frequencies in a variety of HIV risk groups.

Objective: The aim of this document is to outline the methodological protocol of a systematic review that would gather evidence for the optimal frequency of HIV testing among individuals in various HIV risk groups with respect to personal and public health outcomes and cost-effectiveness.

Methods: This protocol adheres to the PRISMA-P reporting items, and the review is registered with PROSPERO. The target population includes individuals who may have undiagnosed HIV infection. Different frequencies of HIV testing will be compared and outcomes to do with personal and public health, patient values/preferences and costs will be examined. The search strategy will encompass searches in MEDLINE/Pubmed, Scopus, Embase, Cochrane, PsychINFO, and EconLit, as well as grey literature sources. Articles will be screened by title/abstract, and subsequently by full-text, in duplicate. Extraction of pertinent data from the screened references will be carried out by one reviewer and verified by a second. Multiple critical appraisal tools will be used to assess individual study quality, and the GRADE approach will be used to appraise the overall quality of the evidence. Data will be synthesized narratively, and the results will be published in a peer-reviewed journal.

Discussion: This systematic review, designed with extensive input from content experts, will help to identify key evidence to inform recommendations for HIV testing frequency.

Suggested citation: Traversy GP, Austin T, Yau J, Timmerman K. Evidence for optimal HIV testing intervals in HIV-negative individuals from various risk groups: a systematic review protocol. Can Commun Dis Rep. 2017;43(2):38-48.

Background

HIV testing is a key element of the HIV cascade of care, representing the first "90" of the Joint United Nations Programme on HIV/AIDS (UNAIDS) 90–90–90 global strategy for addressing HIV/AIDS (1). HIV diagnosis is essential for linkage to care and initiation of antiretroviral therapy (ART), which may subsequently lead to decreased viral load, reduced infectivity and improved personal health outcomes (2,3). Low rates of screening and testing are therefore a potential limiting factor for the success of HIV prevention strategies. Up to 50% of new HIV infections may be attributed to those who are unaware of their infection (4-7). In Canada, it is estimated that individuals who are unaware of their infection represent 21% of all those who are HIV-infected (8).

Certain populations who are at higher risk for HIV infection, such as men who have sex with men (MSM), injection drug users (IDU) or Indigenous peoples, may benefit from more frequent HIV testing. Accordingly, an important question in developing recommendations and strategies for HIV testing is how often should individuals from different risk groups be tested for HIV. Answering this question requires balancing the potential benefits of enhanced screening with the increased costs of the screening, as well as considerations of patient values and preferences.

Clear and specific guidance for how often to test individuals from different risk groups may help health care providers improve their testing behaviours and normalize this practice. A recent systematic review of guidelines found that a number of the guidelines recommend annual screening for groups including MSM and IDU but that others cite a paucity of data frequency of testing for HIV in certain groups, leading to some inconsistencies in guidance (9). At the federal level, the Public Health Agency of Canada's *HIV Screening and Testing Guide* states that individuals involved in high-risk practices should be screened for HIV at least annually but that there is insufficient evidence to provide recommendations for individual scenarios (10).

Many of the guidelines reviewed in the systematic review of guidelines mentioned above are several years old. In addition, guideline developers do not always describe the basis for their recommendations (e.g. systematic review versus expert opinion). A thorough, up-to-date review of scientific evidence related to HIV testing frequency is warranted and will be useful for developing timely quality guidance in Canada and abroad. The purpose of this article is to describe the protocol for a systematic review aimed at answering a number of questions related to how often to test for HIV.

Objective

The objective of the systematic review is to examine the scientific evidence that supports different frequencies of HIV testing for individuals in various risk groups who may have undiagnosed HIV.

The over-arching research question is: What is the optimal frequency of testing for HIV in individuals from various HIV risk groups with respect to personal and public health outcomes and cost-effectiveness? The sub-questions relevant to this include:

- What is the most effective frequency or interval of testing for HIV in people who have unknown or previously confirmed negative serostatus, with respect to personal/public health outcomes?
- What are patients' values and preferences with respect to how often to test/re-test for HIV?
- What are the potential harms associated with different HIV testing frequencies?
- What is the most cost-effective frequency or interval of re-testing for HIV in people who have an unknown or a previously confirmed negative serostatus?

Methods

Prior to the development of this protocol, a scoping search was completed to help guide protocol development and identify any similar works. This scoping search included a review of the reference lists from key guidelines identified in a systematic review of HIV testing guidelines (9) as well as searches for the term "HIV testing" on the websites of the following organizations/registries: Cochrane, the National Institute for Health and Care Excellence (NICE), the Canadian Agency for Drugs and Technologies in Health (CADTH), the UK Department of Health (NHS), the International Resource for Infection Control (iNRIC) and the PROSPERO International Prospective Register of systematic reviews.

This systematic review protocol has been designed in alignment with the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) (11). See **Appendix 1** for a list of the PRISMA-P reporting items.

Drafts of the protocol were peer-reviewed by several experts in infectious disease guideline development from the Public Health Agency of Canada prior to registration of the review with the PROSPERO International Prospective Register of systematic reviews (http://www.crd.york.ac.uk/PROSPERO; registration number CRD42016046575) (12). In addition, a health economist was consulted.

Search strategy

A comprehensive search strategy was designed in consultation with a research librarian. The search strategy was also peer-reviewed by an external research librarian prior to execution of the search. The full search strategy can be found in **Appendix 2**.

The following databases will be searched:

- MEDLINE/PubMed
- Scopus
- Embase
- Cochrane Library
- PsycINFO
- EconLit

The following sources of grey literature will be searched:

- Open Grey
- ClinicalTrials.gov
- All relevant sources from the CADTH Grey Matters checklist (13)

The search strategies that will be used for Open Grey and ClinicalTrials.gov can be found in **Appendix 3**.

The CADTH Grey Matters tool is a checklist used to guide online searches for grey literature. It includes national and international health technology assessment websites, drug and device regulatory agencies, clinical trial registries, health economics resources, Canadian health prevalence or incidence databases and drug formulary web sites (13). A total of 40 relevant websites from the checklist were identified by the research team (drug formulary, drug advisory and warning, and surveillance databases were not considered relevant to the research question, for example). Many of the websites in the checklist do not include an advanced search option, so the large majority will be searched using the term "HIV" to provide the widest range of potentially relevant results. Websites with advanced search functions will be searched with combinations of "HIV" and "testing" or "screening" or "test" or "screen."

Grey literature searches will be carried out by two members of the research team independently, and all articles deemed potentially relevant will be added to the results of the database searches for further screening.

Data management

All references will be uploaded into the DistillerSR, a secure, internet-based systematic review management software (Evidence Partners). This software platform will be used for screening eligible articles, data extraction and quality assessment.

Eligibility criteria

Language

Articles published in English or French will be considered for the review.

Study design

Eligible study designs will vary depending on the specific research sub-question. For all search questions, other systematic reviews will not be explicitly excluded. Rather, the reference lists will be scanned for relevant articles that may have otherwise been missed.

Table 1 outlines the study designs that will be considered for each of the research sub-questions.

Table 1: Study designs eligible for inclusion in the review, by research sub-question

Research sub-question	Eligible study designs
With respect to personal/public health outcomes, what is the most effective frequency or interval of re-testing for HIV in people who have unknown or previously confirmed negative serostatus?	Quantitative (particularly comparative) studies: • Randomized controlled trials (RCTs) • Non-randomized controlled trials • Longitudinal observational studies (e.g. cohort/registry studies) • Before/after designs (e.g. interrupted time series) • Retrospective studies • Intervention studies • Cross-sectional studies • Modelling studies
What are patients' values and preferences with respect to how often to test/re-test for HIV?	Qualitative studies Surveys
What are the potential harms associated with different HIV testing frequencies?	Quantitative and qualitative studies will be considered
What is the most cost-effective frequency or interval of re-testing for HIV in people who have an unknown or a previously confirmed negative serostatus?	Costing studies: • Cost-effectiveness studies, cost-benefit, cost-consequence, cost-utility, cost minimization • Modelling studies

Abbreviation: HIV, human immunodeficiency virus

Population

The target population includes individuals who may have undiagnosed HIV infection.

Intervention

The intervention of interest is HIV screening/testing at varying intervals.

Comparison

The effects of the intervention will be compared to any the following:

- Other interventions
- "Normal" or "standard" state of care (as defined in a given study)
- Before/after comparisons

Setting

Studies will be considered if they are held in any setting where HIV testing could be conducted.

Exclusion criteria

Articles will also be excluded if they are:

- Published prior to 2000
- Commentaries, editorials, letters to the editor, conference abstracts, poster presentations
- Guidelines/ policy papers/ policy documents

Outcomes

Several potential outcomes that could be relevant for each of the research sub-questions have been identified. However, the possibility exists that not all of the outcomes will be represented in the literature, as some may not have been examined. The primary and secondary outcomes of interest for each research question are outlined in **Table 2**.

Table 2: Potential outcomes for each of the research sub-questions

Research sub-question	Outcomes
With respect to personal/public health outcomes, what is the most effective frequency or interval of re-testing for HIV in people who have unknown or previously confirmed negative serostatus?	Primary outcomes: • Time between HIV exposure/infection and diagnosis • CD4 cell count and/or viral load at diagnosis • Number/percent of patients receiving HIV tests • Number of new HIV diagnoses among varying groups • Change in number/percent of individuals with undiagnosed HIV infection (modelling)
	Secondary outcomes: • Number of patients successfully linked to care • Number of patients beginning ART • Number of HIV infections averted (modelling)
What are patients' values and preferences with respect to how often to test/re-test for HIV?	• Patient level of comfort with testing • Uptake of HIV testing • Acceptability of a given testing frequency
What are the potential harms associated with different HIV testing frequencies?	• Psychological distress or other psychosocial harms • Labelling • Feelings of stigmatization • False positives • False negatives Note: Studies of outcomes on psychosocial or other harms related to **true positives** or **true negatives** will not be included.
What is the most cost-effective frequency or interval of re-testing for HIV in people who have an unknown or a previously confirmed negative serostatus?	• All outcomes from the pertinent study types will be considered

Abbreviations: CD4, cluster of differentiation 4; HIV, human immunodeficiency virus; ART, antiretroviral therapy

Screening/selection of articles

All references identified in the search will be screened based on title and abstract following removal of duplicates. The eligibility criteria above will be used to determine inclusion and exclusion

of articles at the title/abstract-screening stage. Screening of titles and abstracts will be performed in duplicate by two reviewers. Disagreements will be reconciled through discussion with a third reviewer.

Full-text screening will be performed on titles with abstracts that meet the above criteria or for cases in which it is unclear whether this is the case. At the full-text screening stage, the eligibility criteria, as well as the outcomes listed above, will guide exclusion of irrelevant articles. Full-text screening will be performed in duplicate by two reviewers. Disagreements will be reconciled through discussion with a third reviewer.

Reasons for exclusion will be recorded at each step of the screening process. The results of the screening will be presented in a flowchart consistent with PRISMA recommendations (14).

Data extraction

Extraction of pertinent data from the screened references will be carried out by one reviewer and verified by another in order to reduce bias or errors in extraction. Any disagreements will be resolved through discussion with one or two other reviewers. Study authors may be contacted if there are any major uncertainties. All pertinent data (i.e. year of publication, period of data collection, study population, sample size, location, study setting, study design, intervention, comparison, results/outcomes, quality assessment score, etc.) will be extracted into evidence tables.

Duplicate, overlapping or companion studies, if identified during the screening process, will be dealt with by extracting the data into a single collection form or by extracting the data separately and combining these into a single input afterwards, as per the Cochrane Handbook for Systematic Reviews of Interventions (15).

Quality assessment

Quality assessment will be carried out for individual studies included in the review, as well as for the overall body of evidence. Different methods of assessment will be used as appropriate for the study type.

The following assessment tools will be used for individual studies:

- Cochrane risk of bias for RCTs (15)
- Effective Public Health Practice Project (EPHPP) Quality Assessment Tool for other quantitative studies (16-18)
- Critical Appraisal Skills Programme (CASP) Qualitative Checklist for qualitative studies (19)

For the overall body of evidence, the quality of evidence will be assessed using the GRADE approach (15).

Data synthesis

Data will be synthesized narratively. If there is sufficient homogeneity among the evidence, a meta-analysis may be considered, although this is unlikely due to the variety of evidence sources being sought.

Subgroup analysis

The initial search will not target any specific subgroups. If evidence emerges for specific subgroups (e.g. MSM, IDU, Indigenous peoples, etc.) then the results will be disaggregated and reported narratively in separate sections for each subgroup.

Assessment of meta-biases

Statistical assessment of meta-biases such as publication bias across studies (e.g. Egger's test) will likely not be possible given the wide variety of evidence being sought and the likelihood of inclusion of a large proportion of studies with observational designs (20). The potential for publication bias will however be reduced by employing a rigorous search of grey literature, and the potential for substantial publication bias in observational studies will be taken into account when assessing the overall body of evidence using the GRADE approach (20). Selective outcome reporting will be assessed in RCTs by comparing the reported results of studies with the outcomes reported in the methods section of the protocol of the study. This will factor into quality assessment with the Cochrane risk of bias tool (15).

Amendments

The research team does not foresee any amendments to the protocol prior to carrying out the systematic review. However, if this is necessary, all amendments will be recorded as they occur and reflected in the PROSPERO record for this review. Amendments will also be documented in the final publication.

Dissemination

A manuscript of the results of the systematic review will be prepared and submitted for publication in a peer-reviewed journal. The results will be presented according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (14).

Discussion

To the best of our knowledge, this will be the first published systematic review examining evidence supporting recommendations for HIV testing frequency. The evidence identified in this review may be useful to update or create new guidance around HIV testing in Canada; groups outside Canada may also find it useful. The development of specific, evidence-based recommendations will help health care providers streamline and improve their HIV testing practices. Such recommendations can also be used by the public to manage their own sexual health.

Enhanced HIV screening and testing will help decrease the substantial portion of individuals with HIV who are unaware of their infection. This group contributes to a substantial proportion of new HIV infections, and evidence suggests that once these individuals are aware of their infection, they will be more likely to take steps to minimize the likelihood of transmission (4,21). HIV diagnosis is also the first step toward obtaining treatment, and thus, enhanced screening and testing yields benefits for personal and public health.

The strengths of this systematic review protocol include extensive input from content experts in the development of HIV and sexually transmitted infection guidelines and health economics. Another strength is the external peer review of the research librarian–designed search strategy.

One limitation of the review could be the potential inclusion of predominantly observational studies, given the difficulty of carrying out experimental studies on the topic. This may raise concerns regarding the quality of evidence; however, the results of the quality assessments will be published, and thus assessment of bias in the evidence will be transparent.

If this systematic review fails to find evidence to answer one or more of the research questions, this will be documented in the results. A "negative" finding will still be of use to guideline developers as it provides validity to those guidelines that cite a lack of evidence for HIV-testing interval recommendations (9) and suggests that such recommendations may need to be made on a jurisdiction-by-jurisdiction basis, based on expert opinion. It would also help highlight gaps in evidence, which could be useful for guiding future research.

Acknowledgements

We would like to thank Michèle Sabourin, Kelsey Young, Lisa Pogany, Rachel Bennett, Ulrick Auguste, Cathy Latham-Carmanico, Bakhtiar Anwar, Jun Wu and Margaret Gale-Rowe for their constructive review and feedback on the draft protocol. We would also like to thank the research librarians, Connie Barrowclough and Katherine Merucci, who helped design and carry out our systematic search, and Margaret Sampson for peer-reviewing the search strategy.

Authors' contributions

KT is the guarantor. GT drafted the protocol for the review, and all authors made substantial contributions to refine the research question/sub-questions, the study eligibility and exclusion criteria, the outcomes of interest, the screening, extraction and quality assessment processes, and the search strategy (with the help of a trained research librarian). GT, TA and JY will draft the manuscript. All authors will read, provide feedback and approve the final manuscript.

Conflict of interest

None.

Funding

This study was supported by the Public Health Agency of Canada. The authors have no sources of external funding to declare.

References

1. Joint United Nations Programme on HIV/AIDS. 90-90-90: An ambitious treatment target to help end the AIDS epidemic. Geneva: UNAIDS; 2014.
2. INSIGHT START Study Group, Lundgren JD, Babiker AG, Gordin F, Emery S, Grund B, Sharma S, Avihingsanon A, Cooper DA, Fätkenheuer G, Llibre JM, Molina JM, Munderi P, Schechter M, Wood R, Klingman KL, Collins S, Lane HC, Phillips AN, Neaton JD. Initiation of antiretroviral therapy in early asymptomatic HIV infection. N Engl J Med. 2015 Aug 27;373(9):795-807.
3. Cohen MS, Chen YQ, McCauley M, Gamble T, Hosseinipour MC, Kumarasamy N, Hakim JG, Kumwenda J, Grinsztejn B, Pilotto JH, Godbole SV, Mehendale S, Chariyalertsak S, Santos BR, Mayer KH, Hoffman IF, Eshleman SH, Piwowar-Manning E, Wang L, Makhema J, Mills LA, de Bruyn G, Sanne I, Eron J, Gallant J, Havlir D, Swindells S, Ribaudo H, Elharrar V, Burns D, Taha TE, Nielsen-Saines K, Celentano D, Essex M, Fleming TR; HPTN 052 Study Team. Prevention of HIV-1 Infection with early antiretroviral therapy. N Engl J Med. 2011;365(6):493-505.
4. Marks G, Crepaz N, Janssen RS. Estimating sexual transmission of HIV from persons aware and unaware that they are infected with the virus in the USA. AIDS. 2006;20(10):1447-50.
5. McNairy ML, El-Sadr WM. Antiretroviral therapy for the prevention of HIV transmission: what will it take? Clin Infect Dis. 2014;58(7):1003-11.
6. McNairy ML, Cohen M, El-Sadr WM. Antiretroviral therapy for prevention is a combination strategy. Curr HIV/AIDS Rep. 2013;10(2):152-8.
7. Skarbinski J, Rosenberg E, Paz-Bailey G, Hall HI, Rose CE, Viall AH, et al. Human immunodeficiency virus transmission at each step of the care continuum in the United States. JAMA Intern Med. 2015;175(4):588-96.
8. Tomas K, Dhami P, Houston C, Ogunnaike-Cooke S, Rank C. HIV in Canada: 2009 to 2014. Can Comm Dis Rep. 2015;41(12):292-304. Available from: http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/15vol41/dr-rm41-12/ar-01-eng.php.
9. Austin T, Traversy GP, Ha S, Timmerman K. Canadian and international recommendations on the frequency of HIV screening and testing: a systematic review. Can Comm Dis Rep. 2016;42:161-8. Available from: http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/16vol42/dr-rm42-8/ar-03-eng.php.
10. Public Health Agency of Canada. Human immunodeficiency virus: HIV screening and testing guide [Internet]. 2012 (modified 2014 Aug 5; cited 2016 Nov 21). Available from: http://www.phac-aspc.gc.ca/aids-sida/guide/hivstg-vihgdd-eng.php.
11. Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart LA; PRISMA-P Group.. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015;349:g7647. doi: 10.1136/bmj.g7647.
12. University of York Centre for Reviews and Dissemination. Guidance notes for registering a systematic review protocol with PROSPERO [Internet]. Toronto (ON): Univeristy of York:

2016 May (cited 2016 Nov 21). Available from: http://www.crd.york.ac.uk/PROSPERO/documents/Registering%20a%20review%20on%20PROSPERO.pdf.

13. Canadian Agency for Drugs and Technologies in Health. Grey Matters: a practical tool for searching health-related grey literature [Internet]. Ottawa (ON): CADTH; 2015 Dec (cited 2016 Oct). Available from: https://www.cadth.ca/resources/finding-evidence/grey-matters
14. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gotzsche PC, Ioannidis JP, Clarke M, Devereaux PJ, Kleijnen J, Moher D. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. BMJ. 2009;339:b2700. doi: 10.1136/bmj.b2700.
15. Higgins JPT, Green S, editors. Cochrane handbook for systematic reviews of interventions. Version 5.1.0. London (UK): The Cochrane Collaboration; 2011.
16. Armijo-Olivo S, Stiles CR, Hagen NA, Biondo PD, Cummings GG. Assessment of study quality for systematic reviews: a comparison of the Cochrane Collaboration Risk of Bias Tool and the Effective Public Health Practice Project Quality Assessment tool: methodological research. J Eval Clin Pract. 2012;18(1):12-8.
17. Thomas BH, Ciliska D, Dobbins M, Micucci S. A process for systematically reviewing the literature: providing the research evidence for public health nursing interventions. Worldviews Evid Based Nurs. 2004;1(3):176-84.
18. Deeks JJ, Dinnes J, D'Amico R, Sowden AJ, Sakarovitch C, Song F, Petticrew M, Altman DG. Evaluating non-randomised intervention studies. Health Technol Assess. 2003;7(27):1-173.
19. Hannes K. Chapter 4: Critical appraisal of qualitative research. In: Noyes J, Booth A, Hannes K, Harden A, Harris J, Lewin S, Lockwood C, editors. Supplementary guidance for inclusion of qualitative research in Cochrane Systematic Reviews of Interventions: Cochrane Collaboration Qualitative Methods Group; 2011.
20. Guyatt GH, Oxman AD, Montori V, Vist G, Kunz R, Brozek J, Alonso-Coello P, Djulbegovic B, Atkins D, Falck-Ytter Y, Williams JW Jr, Meerpohl J, Norris SL, Akl EA, Schünemann HJ. GRADE guidelines: 5. Rating the quality of evidence - publication bias. J Clin Epidemiol. 2011:12;64(12):1277-82.
21. Marks G, Crepaz N, Senterfitt JW, Janssen RS. Meta-analysis of high-risk sexual behavior in persons aware and unaware they are infected with HIV in the United States: implications for HIV prevention programs. J Acquir Immune Defic Syndr. 2005;39(4):446-53.

Appendix 1: Completed PRISMA-P checklist for the systematic review

Section and topic	Item	Checklist item	Line no(s).
ADMINISTRATIVE INFORMATION			
Title:			
Identification	1a	Identify the report as a protocol of a systematic review	1, 67
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	N/A
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	103
Authors:			
Contact	3a	Provide name, institutional affiliation, email address of all protocol authors; provide physical mailing address of corresponding author	4-7
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	262-267
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	220-224
Support:			
Sources	5a	Indicate sources of financial or other support for the review	270-273
Sponsor	5b	Provide name for the review funder and/or sponsor	270-273
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s) and/or institution(s), if any, in developing the protocol	N/A
INTRODUCTION			
Rationale	6	Describe the rationale for the review in the context of what is already known	52-68
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	151-174
METHODS			
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	140-174
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	109-129, 145, 191-192
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, so that it could be repeated	344
Study records:			
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	137
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	175-187
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	188-199
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	192-194
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	173
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	200-209
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesized	213
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I^2, Kendall's τ)	N/A
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	216-219
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	212-219
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	220-229
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	210-211

Abbreviation: Line no(s), Line numbers

Appendix 2: Search Strategy

All searches run and downloaded on September 16, 2016.

Database(s): Econlit 1886 to August 2016

Search Strategy:

No.	Searches	Results
1	(hiv or hiv+ or hiv-1 or hiv-2 or hiv1 or hiv2 or hivaids or (human immun* adj2 virus) or virus de l'immunodeficience humaine or vih or vih+ or vih1 or vih2 or vih-1 or vih-2).af.	1713
2	(screen* or rescreen* or test or tests or testing or tested or retest* or depistage or "diagnostic du VIH").af.	91581
3	(freque* or interval*).af.	26404
4	((time or timing or moment or temps or often or souvent*) adj3 (screen* or rescreen* or test* or retest* or depistage or "diagnostic du VIH")).af.	1484
5	1 and 2 and 3	5
6	1 and 4	2
7	or/5-6	7
8	limit 7 to yr="2000 -Current"	6

Abbreviation: No., Number

Database(s): PsycINFO 1806 to July Week 4 2016

Search Strategy:

No.	Searches	Results
1	exp hiv/	36417
2	(hiv or hiv+ or hiv-1 or hiv-2 or hiv1 or hiv2 or hivaids or (human immun* adj2 virus) or virus de l'immunodeficience humaine or vih or vih+ or vih1 or vih2 or vih-1 or vih-2).ti.	27738
3	(hiv or hiv+ or hiv-1 or hiv-2 or hiv1 or hiv2 or hivaids or (human immun* adj2 virus) or virus de l'immunodeficience humaine or vih or vih+ or vih1 or vih2 or vih-1 or vih-2).ab. /freq=2	31713
4	or/1-3	41632
5	screening/	8117
6	screening tests/	5000
7	health screening/	2451
8	(screen* or rescreen* or test or tests or testing or tested or retest* or depistage or "diagnostic du VIH"). ti.	102858
9	(screen* or rescreen* or test or tests or testing or tested or retest* or depistage or "diagnostic du VIH"). ab. /freq=2	258239
10	or/5-9	304851
11	hiv test/	1880
12	(freque* or interval*).ti.	22666
13	(freque* or interval*).ab. /freq=2	91053
14	or/12-13	100641
15	((time or timing or moment or temps or often or souvent*) adj3 (screen* or rescreen* or test* or retest* or depistage or "diagnostic du VIH")).ti.	575
16	((time or timing or moment or temps or often or souvent*) adj3 (screen* or rescreen* or test* or retest* or depistage or "diagnostic du VIH")).ab. /freq=2	918
17	or/15-16	1366
18	(10 and 14) or 17	10859
19	4 and 18	197
20	11 and (14 or 17)	69
21	or/19-20	200
22	Dissertation Abstract.pt.	413976
23	animals/	6443
24	case report/ or case report.tw.	36249
25	or/22-24	456006
26	21 not 25	176
27	limit 26 to yr="2000 -Current"	164

Abbreviation: No., Number

Database(s): Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R) 1946 to Present (20151216.up)

Search Strategy:

No.	Searches	Results
1	(hiv or hiv+ or hiv-1 or hiv-2 or hiv1 or hiv2 or hivaids or (human immun* adj2 virus) or virus de l'immunodeficience humaine or vih or vih+ or vih1 or vih2 or vih-1 or vih-2).ti,kf.	204027
2	(hiv or hiv+ or hiv-1 or hiv-2 or hiv1 or hiv2 or hivaids or (human immun* adj2 virus) or virus de l'immunodeficience humaine or vih or vih+ or vih1 or vih2 or vih-1 or vih-2).ab. /freq=2	178603
3	exp HIV Infections/	252533
4	exp HIV/	89772
5	HIV Antibodies/	10284
6	or/1-5	326372
7	mass screening/	90016
8	Serologic Tests/	18348
9	(screen* or rescreen* or test or tests or testing or tested or retest* or depistage or "diagnostic du VIH").ti,kf.	470662
10	(screen* or rescreen* or test or tests or testing or tested or retest* or depistage or "diagnostic du VIH").ab. /freq=2	935790
11	or/7-10	1246845
12	AIDS serodiagnosis/	6381
13	(freque* or interval*).ti,kf.	132544
14	(freque* or interval*).ab. /freq=2	521701
15	or/13-14	594802
16	((time or timing or moment or temps or often or souvent*) adj3 (screen* or rescreen* or test or tests or testing or tested or retest* or depistage or "diagnostic du VIH")).ti,kf.	2150
17	((time or timing or moment or temps or often or souvent*) adj3 (screen* or rescreen* or test or tests or testing or tested or retest* or depistage or "diagnostic du VIH")).ab. /freq=2	2569
18	or/16-17	4359
19	(11 and 15) or 18	54568
20	6 and 19	1580
21	12 and (15 or 18)	157
22	20 or 21	1610
23	(letter or editorial).pt.	1360656
24	animal/	5981714
25	human/	16333570
26	24 not (24 and 25)	4284662
27	case reports/ or case report.tw.	1885376
28	or/23,26-27	7265507
29	22 not 28	1567
30	limit 29 to yr="2000 -Current"	1171

Abbreviation: No., Number

Scopus : Run September 16, 2016

TITLE ("**hiv**" OR "**hiv1**" OR "**hiv2** " OR "**hivaids**" OR "**human immune deficiency virus**" OR "**human immunodeficiency virus**" OR "**virus de l'immunodeficience humaine**" OR "**vih**" OR "**vih1**" OR "**vih2**")

AND ((TITLE ((**time** OR **timing** OR **moment** OR **temps** OR often OR **souvent***) W/3 (**screen*** OR **rescreen*** OR **test** OR **tests** OR **tested** OR **testing** OR **retest*** OR "**diagnostic du VIH**" OR **depistage**))) OR ((TITLE-ABS (**screen*** OR **rescreen*** OR **test** OR **tests** OR **tested** OR **testing** OR **retest*** OR "**diagnostic du VIH**" OR **depistage**))

AND (TITLE-ABS (**freque*** OR **interval***))))

AND (PUBYEAR > **1999**)

AND SUBJAREA (**mult** OR **arts** OR **busi** OR **deci** OR **econ** OR **psyc** OR **soci**)

429 records

Database(s): Embase 1974 to 2016 September 15

Search Strategy:

No.	Searches	Results
1	(hiv or hiv+ or hiv-1 or hiv-2 or hiv1 or hiv2 or hivaids or (human immun* adj2 virus) or virus de l'immunodeficience humaine or vih or vih+ or vih1 or vih2 or vih-1 or vih-2).ti,kw.	246105
2	(hiv or hiv+ or hiv-1 or hiv-2 or hiv1 or hiv2 or hivaids or (human immun* adj2 virus) or virus de l'immunodeficience humaine or vih or vih+ or vih1 or vih2 or vih-1 or vih-2).ab. /freq=2	204295
3	exp Human immunodeficiency virus infection/	328710
4	exp Human immunodeficiency virus/	160405
5	Human immunodeficiency virus antigen/	1810
6	Human immunodeficiency virus antibody/	8917
7	Human immunodeficiency virus infected patient/	26547
8	or/1-7	435387
9	mass screening/	52549
10	screening/	149792
11	screening test/	55924
12	rescreening/	227
13	serodiagnosis/	42942
14	(screen* or rescreen* or test or tests or testing or tested or retest* or depistage or "diagnostic du VIH").ti,kw.	608987
15	(screen* or rescreen* or test or tests or testing or tested or retest* or depistage or "diagnostic du VIH").ab. / freq=2	1265723
16	or/9-15	1709594
17	exp hiv test/	6818
18	(freque* or interval*).ti,kw.	162041
19	(freque* or interval*).ab. /freq=2	651528
20	or/18-19	739551
21	((time or timing or moment or temps or often or souvent*) adj3 (screen* or rescreen* or test or tests or testing or tested or retest* or depistage or "diagnostic du VIH")).ti,kw.	2617
22	((time or timing or moment or temps or often or souvent*) adj3 (screen* or rescreen* or test or tests or testing or tested or retest* or depistage or "diagnostic du VIH")).ab. /freq=2	3598
23	or/21-22	5775
24	(16 and 20) or 23	81929
25	8 and 24	2539
26	17 and (20 or 23)	316
27	or/25-26	2607
28	(letter or editorial).pt.	1480511
29	animal/	1803158
30	human/	17470047
31	29 not (29 and 30)	1350042
32	case study/ or case report.tw.	362306
33	or/28,31-32	3168665
34	27 not 33	2557
35	limit 34 to yr="2000 -Current"	2174

Abbreviation: No., Number

Cochrane

Date Run: 16/09/16 19:05:13.171
Description:

ID	Search	Hits
#1	[mh "HIV Infections"] or [mh HIV]	9272
#2	[mh ^"HIV Antibodies"]	238
#3	(hiv or hiv-1 or hiv-2 or hiv1 or hiv2 or hivaids or human immune deficiency virus or human immunodeficiency virus or human immuno-deficiency virus or human immune-deficiency virus or virus de l'immunodeficience humaine or vih or vih1 or vih2 or vih-1 or vih-2):ti	9923
#4	#1 or #2 or #3	12575
#5	[mh ^"mass screening"] or [mh ^"serologic tests"]	4877
#6	(screen* or rescreen* or test or tests or tested or testing or retest* or depistage or "diagnostic du VIH"):ti	21763
#7	#5 or #6	22979
#8	(freque* or interval*):ti	6568
#9	((time or timing or moment or temps or souvent*) near/3 (screen* or rescreen* or test or tests or tested or testing or retest* or "diagnostic du VIH" or depistage)):ti	147
#10	#8 or #9	6710
#11	[mh ^"AIDS serodiagnosis"]	143
#12	(#7 and #8) or #9	332
#13	#10 and #11	3
#14	#4 and #12	17
#15	#13 or #14 Publication Year from 2000 to 2016	3

Abbreviation: ID, Identification number

Appendix 3: Grey Literature Searches

All grey literature searches run on October 27, 2016.

Open Grey

("HIV" OR "HIV+" or "HIV-1" OR "HIV-2" OR "HIV1" OR "HIV2" OR "HIVAIDS" OR ("human immun*" NEAR/2 "virus") OR "human immunodeficiency virus" OR "human immunodeficiency virus infection") AND ("screening" OR "test*" OR "retest*" OR "rescreen*" OR "re-test*" OR "re-screen*")

Results: 163 items returned

Link to results:
http://www.opengrey.eu/search/request?q=%28%22HIV%22+OR+%22HIV%2B%22+or+%22HIV-1%22+OR+%22HIV-2%22+OR+%22HIV1%22+OR+%22HIV2%22+OR+%22HIVAIDS%22+OR+%28%22human+immun*%22+NEAR%2F2+%22virus%22%29+OR+%22human+immunodeficiency+virus%22+OR+%22human+immunodeficiency+virus+infection%22%29+AND+%28%22screening%22+OR+%22test*%22+OR+%22retest*%22+OR+%22rescreen*%22+OR+%22re-test*%22+OR+%22re-screen*%22%29+

ClinicalTrials.gov

Advanced search:

Conditions: "HIV" OR "HIV+" or "HIV-1" OR "HIV-2" OR "HIV1" OR "HIV2" OR "HIVAIDS" OR "human immunodeficiency virus"

Interventions: "screening" OR "testing" OR "retesting" OR "rescreening" OR "re-testing" OR "re-screening"

Timeframe: Studies received on or after 01/01/2000

Results: 649 items returned

Link to results: Clinical Trials.gov (https://clinicaltrials.gov/ct2/results/displayOpt?flds=a&flds=b&flds=t&submit_fld_opt=on&=Update+Display&cond=%22HIV%22+OR+%22HIV%2B%22+or+%22HIV-1%22+OR+%22HIV-2%22+OR+%22HIV1%22+OR+%22HIV2%22+OR+%22HIVAIDS%22+OR+%22human+immunodeficiency+virus%22&intr=%22screening%22+OR+%22testing%22+OR+%22retesting%22+OR+%22rescreening%22+OR+%22re-testing%22+OR+%22re-screening%22&rcv_s=01%2F01%2F2000&show_flds=Y)

Get CCDR delivered to your inbox
• Know the trends
• Get the testing guidelines
• Stay current on new vaccines
• Learn about emerging infections
• Get the table of contents straight to your inbox
SUBSCRIBE TODAY
Web search: CCDR+Subscribe

Use of a 40-day rolling incidence to monitor pertussis in Nova Scotia, 2015

J Born[1,2]*, A Coombs[1,4], V Ryan[2], M LaFreniere[2,3], L Earle[2], S Fleming[2], A Fitzgerald[2], F Atherton[2]

Affiliations

[1] Centre for Public Health Infrastructure, Public Health Agency of Canada, Ottawa, ON

[2] Department of Health and Wellness, Halifax, NS

[3] Centre for Communicable Diseases and Infection Control, Public Health Agency of Canada, Ottawa, ON

[4] Nova Scotia Health Authority, Kentville, NS

*** Correspondence:** jennifer.born@forces.gc.ca

Abstract

Background: Pertussis can cause a serious respiratory bacterial infection, especially in infants. Between January 1 and December 31, 2015, there was an increase in the number of reported pertussis cases in Nova Scotia (NS). Surveillance practices for pertussis in NS were challenging because immunization coverage data are not available and rate information was neither timely nor precise with respect to geography. Public health officials in NS decided to adopt a new surveillance technique to inform public health actions across the Province.

Objective: To assess the use of a 40-day rolling incidence rate to monitor pertussis activity in Nova Scotia.

Intervention: A 40-day rolling incidence rate was calculated for pertussis by age groups and various levels of geography. Public health authorities continued to anticipate new cases of pertussis if the contacts of known cases were still within the incubation period (range between six and 20 days). The 40-day incubation period was chosen to reflect twice the incubation period's upper range. Rates were calculated using Statistics Canada population projections for 2014 and then compared with traditional case counts and cumulative incidences. The usefulness of the statistics was assessed by public health decision makers.

Outcomes: Increased pertussis activity was noted across NS, most notably in the South West region. The use of a 40-day rolling incidence rate as a surveillance tool provided more timely and geographically precise descriptions of ongoing trends in pertussis activity and helped to inform appropriate public health action. Health officials valued the information provided from the rolling incidence because it allowed them to manage activities based on weekly estimates at various levels of geography.

Conclusion: Rolling incidence proved to be a useful tool to monitor a cyclical increase in pertussis cases in Nova Scotia and to inform related public health actions. The rolling incidence provided geographically precise and timely information that was useful to estimate new cases in the absence of reliable immunization coverage information. This method could supplement traditional epidemiological surveillance of future communicable disease events, especially those characterized by long incubation periods and low case counts.

Suggested citation: Born J, Coombs A, Ryan V, LaFreniere M, Earle L, Fleming S, Fitzgerald A, Atherton F. Use of a 40-day rolling incidence to monitor pertussis in Nova Scotia, 2015. Can Commun Dis Rep. 2017;43(2):49-55.

Introduction

Pertussis (whooping cough) is a highly contagious respiratory infection caused by *Bordetella pertussis* bacteria. It is endemic in the human population and challenging to control in part due to a long communicable period (six to 20 days) (1-3), under-immunization of the population and evidence of waning vaccine immunity. Illness may be particularly severe in children under 12 months (1) with complications including pneumonia, seizures, encephalopathy, hernias and death (4). Milder forms of the disease may manifest in adults and adolescents who are less likely to be diagnosed and treated (5,6). Evidence suggests that children are falling behind in immunizations (7,8) and immunity post vaccination may wane over time (9,10) creating a vulnerable population that contributes to an ongoing reservoir of pertussis in humans (11,12).

Pertussis activity can be cyclical in nature (13-15). Between January 1 and December 31, 2015, Nova Scotia (NS) experienced an increase in the number of pertussis cases. This triggered a need to more closely monitor and analyze pertussis activity within the Province. The structure of the health system in NS comprises two health authorities, the Nova Scotia Health Authority (NSHA) (subdivided into four local management zones) and the Izaak Walton Killam (IWK) Health Authority. In line with recommendations from Canada and the World Health Organization for pertussis surveillance (16,17), notifiable disease data is reported monthly at the zone and provincial levels and on an annual basis at the provincial level.

During the 2015 pertussis outbreak, monthly and annual surveillance reports did not fully meet the information needs of local public health authorities to respond to the increase in the number of pertussis cases. Given that NS is a small province (total population less than one million), frequently reporting on pertussis activity (e.g. weekly) and by health zone (or lower level geographies) presents challenges due to small case counts. Findings are statistically less reliable when disease events are rare (18) and reporting low counts may threaten confidentiality, especially in smaller populations (19,20).

To mitigate the challenges presented by small numbers, other options were considered. The year-to-date cumulative incidence was considered problematic as it did not accurately reflect current disease activity. Because cumulative incidence was calculated with a static denominator, the trend line simply increased weekly so it did not reveal increases or decreases from week to week. The attack rate was also considered, but poor immunization coverage data made it difficult to quantify the susceptible populations.

Public health authorities decided to try a 40-day rolling incidence rate. The 40-day interval was chosen to conservatively reflect twice the upper range of the six to 20-day incubation period. Rolling estimates have been used in outbreak situations (21), often in the form of an arbitrary five year rolling average to define normal activity or establish baselines for comparisons. To the best of the authors' knowledge, this is the first documented use of a rolling incidence rate developed to reflect disease specific qualities (i.e incubation period) and to anticipate disease activity.

The objective of this article is to describe the first use of a 40-day rolling incidence rate to monitor pertussis activity and to assess whether this method assisted in guiding public health action. This method supplemented routine surveillance during an increase in pertussis activity in NS between January 1 and December 31, 2015.

Intervention

Data sources

Confirmed pertussis cases reported based on episode date

The Application for Notifiable Disease Surveillance (ANDS) was used for ongoing surveillance of NS pertussis cases that met the provincial case definitions (confirmed, probable and suspect) (22). Demographic information (including age and geographical area of residence) were also extracted from ANDS using COGNOS, a commercial software extraction, analysis and reporting package. This information was used to calculate the number of confirmed pertussis cases based on reported episode date by month and geographical area. Episode date most often referred to the onset date of symptoms. Clinical diagnosis date was used if onset date was unavailable and specimen collection date was used if neither onset date nor clinical diagnosis date were available. Lab test result date was used only when no other dates were available (23).

Data analysis

Traditional statistics

Cases reported between January 1, 2015 and December 31, 2015, were extracted monthly from ANDS using COGNOS. Traditional statistics including monthly counts and rate per 100,000 were calculated monthly for the Province overall and by zones.

Rolling incidence

Retrospective cases from 2015 and the last 40 days of 2014 were used to calculate the rolling incidence rates for all of 2015 (based on episode date). Confirmed cases reported between November 21, 2014 and December 31, 2015 were extracted from ANDS using COGNOS and used to calculate the 40-day rolling incidence rates for 2015.

For each calendar day in 2015, the incidence of pertussis was calculated for the previous 40-days using the reported episode date. The 40-day incidence rate was chosen because it represented twice the outer range of days for the typical incubation for pertussis (range 6-20 days) (1,3). Based on an average maximum incubation period of 20 days, a case and any relevant contacts were considered non-infectious 40 days the from the episode date of the case.

Rolling incidence (*MI*) was defined as the sum of cases (A) over the previous n days divided by the person-time (PT) (*mathematical equation available upon request*).

Populations were assumed to be static and all at risk, thus each person in the respective populations contributed one unit of time to the denominator. The rolling incidence was calculated for each calendar day (t) by summing the number of pertussis cases (A) within the previous 40-days over the person-time. Rates were calculated in Stata (24) using 2014 demographic data from Statistics Canada (25). Rates per 100,000 population were calculated at different geographies, including four provincial health management zones and the South West geographic area – a sub-section of the Western Zone that concerned local health officials.

Assessing the usefulness of traditional methods and the 40-day rolling incidence rate

The rolling incidence methods were developed through an iterative process. To supplement monthly and annual reporting, the Population Health Assessment and Surveillance team (PHAS) first created a weekly report that included pertussis case counts by zone and age groups. This data was disseminated to public health staff, Medical Officers of Health (MOHs), epidemiologists and communicable disease managers at the provincial Department of Health and Wellness (DHW) and local (NSHA) levels of the public health system. The rolling incidence rate was developed as an additional statistic based on the feedback received from public health stakeholders. Throughout 2015, the

PHAS team not only collected stakeholder feedback with respect to the usefulness of the weekly information but also summarized the usefulness of the rolling incidence rate to inform public health action.

Outcomes

Pertussis activity

One hundred thirty-six (136) cases of pertussis were reported in NS between January 1 and December 31, 2015. Of those, 105 (76.5%) met the case definition for a confirmed case based on laboratory confirmation or an epidemiological link to a laboratory confirmed case, 10 (7.4%) were probable cases and 21 (15.4%) were suspect cases. The cases ranged in age from 0 to 62 years, with a mean age of 15.6 years. The highest proportion of cases was reported in individuals 20 years and older, while the highest cumulative incidence rate occurred in those under five years (**Table 1**). By December 31, 2015, the provincial cumulative incidence rate was 11.2 per 100,000 population (Table 1).

Table 1: Case counts and cumulative incidence of confirmed pertussis cases for health management zones and South West, reported in Nova Scotia between January 1 and December 31, 2015

Age group (years)	South West[1]	Heath management zone					Population	CI[2]
		Eastern	Western	Northern	Central	Total		
0-4	9	4	12	1	13	30	39,271	76.4
5-9	8	3	11	1	5	20	43,825	45.6
10-14	6	0	6	4	5	15	45,850	32.7
15-19	7	1	7	1	0	9	54,060	16.6
20+	16	3	16	3	9	31	755,819	4.1
Total	46	11	52	10	32	105	n/a	n/a
Population	56,352	165,727	196,648	154,834	421,616	n/a	938,825	n/a
CI[2]	81.6	6.6	26.4	6.5	7.6	n/a	n/a	11.2

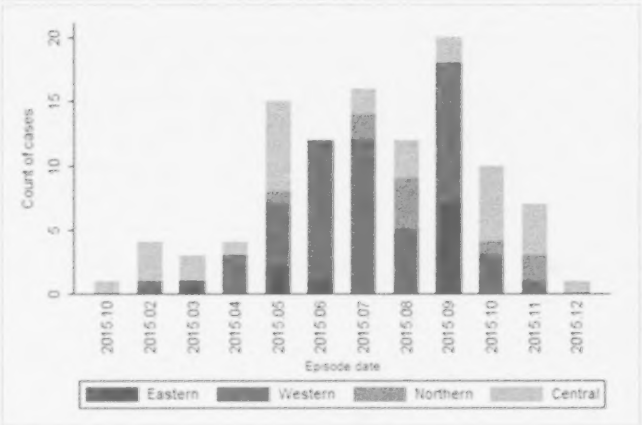
Abbreviation: n/a, not applicable; CI, cumulative incidence
[1] Shelburne, Yarmouth and Digby counties
[2] Per 100,000 population

Cases were reported from all four provincial health management zones: 9.5% (Northern), 10.5% (Eastern), 30.5% (Central) and 49.5% (Western). The highest cumulative incidence (26.4 per 100,000) in the Province was reported in the Western Zone with 43.8% of the provincial cases in South West. By the end of 2015, the annual incidence rate of pertussis in the South West was 81.6 per 100,000.

Comparing the different surveillance tools

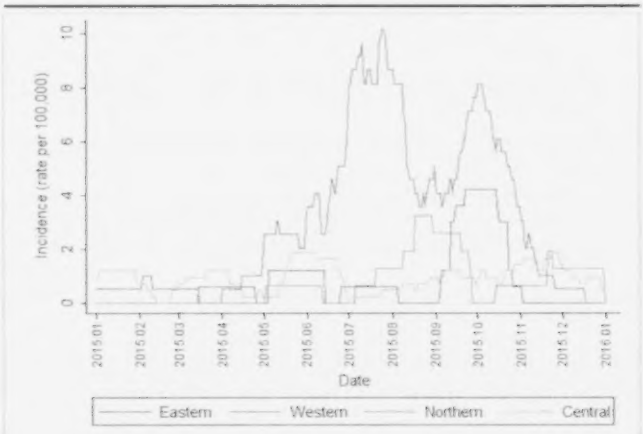
Traditional methods were reported monthly. They showed that the number of cases first peaked in May, 2015 and began to drop after September, 2015. A maximum of 20 confirmed cases were reported monthly (**Figure 1**) with an average of 2.0 cases per week during 2015 (range of 0 to 7 cases). At the zone level, there was an average of 0.2, 1.0, 0.2 and 0.6 cases per week for the Eastern, Western, Northern and Central Zones, respectively. Feedback from public health stakeholders highlighted difficulties in stratifying and contextualizing these low case counts. Additionally, they reported difficulty identifying temporal trends by zones or smaller geographic areas using only counts. Based on feedback, weekly 40-day rolling incidence rate graphics were created for various levels of geography (province, zones, area) and age groups.

Figure 1: Monthly counts of confirmed pertussis cases by health management zone reported in Nova Scotia between January 1 and December 31, 2015



Following the implementation of the 40-day rolling incidence rate into weekly reporting, stakeholders reported that the new format was useful because it was much more timely than monthly reporting. The 40-day rolling incidence statistic provided clear and contextual representation of disease activity within each zone, when compared to weekly case counts. This statistic was useful to explore temporal trends in zonal and sub-zonal areas within NS not possible with count data. For example, over time, cases from the Western Zone (**Figure 2**) produced a bimodal pattern with rolling incidence peaks in July and again in October 2015. Cases in the Eastern Zone followed a single wave, which peaked in October, while cases in the Northern Zone, increased earlier and peaked in August. Weekly counts were also limited in their usefulness because they could not account for the variation in population sizes across zones or age groups. Weekly case counts of pertussis in the Central Zone were relatively high compared to other zones, likely because of the large population. However, the rolling incidence statistic could contextualize

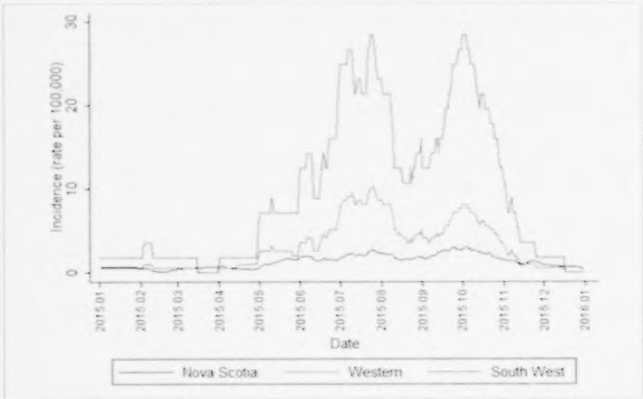
Figure 2: Rolling 40-day incidence calculated per 100,000 population of confirmed pertussis cases by health management zone in Nova Scotia, 2015



pertussis activity and the resulting analysis demonstrated that activity in the Central Zone was generally lower and more sporadic, without the clear large peaks observed in other zones.

By July 1, 2015, the provincial year-to-date cumulative incidence rate for pertussis was 4.2 per 100,000 population; 10.2 per 100,000 in the Western Zone and 31.9 per 100,000 in the South West area. Stakeholders requested a statistic that was more reflective of the current activity level, as weekly case counts or annual cumulative incidence rates were not useful to inform the implementation of interventions across various geographic levels. Case counts were too small to provide meaningful comparisons as they were not adjusted for population size, while annual cumulative incidence exaggerated the current disease activity as the non-contagious cases were not removed from the estimates. In comparison, on July 1 the 40-day rolling incidence was 0.5 per 100,000 population in NS, 8.1 per 100,000 in the Western Zone and 24.8 per 100,000 in the South West area (**Figure 3**). The 40-day rolling incidence highlighted the need for interventions within the South West area as recommended by the local MOH. Similarly, the rolling incidence estimates did not support the implementation of zone- or province-wide public health actions.

Figure 3: Rolling 40-day incidence per 100,000 population of confirmed pertussis cases reported in Nova Scotia, Western Zone and South West area, 2015



The analysis was important in informing appropriate public health action at different geographic levels. Figure 3 provides a comparison of rolling incidence rates across three levels of geography. Activity was slightly elevated across the Province, with the highest rates observed in the South West area of the Western Zone. Local providers in the South West area were requested to focus on the immunization of children to bring them up-to-date with provincial guidelines, particularly for those 0-4 years of age and to offer immunizations to all pregnant women over 26 weeks gestation, regardless of their immunization status. The latter recommendation differed from the provincial recommendation that only pregnant women 26 weeks gestation or greater who had not received a dose of pertussis vaccine in adulthood be vaccinated, yet was in keeping with the National Advisory Committee on Immunization (NACI) recommendations for pertussis based on local epidemiology that demonstrated increased activity (26).

Intervention experience

During the period of increased pertussis incidence in NS, there was considerable debate about whether there was a need to intensify control interventions in either the whole or parts of the Province. The 40-day rolling incidence provided greater insight into the timing of peak pertussis incidence and thereby informed a decision by provincial public health authorities that additional control measures instituted in the geographical area of highest activity were not required at a provincial level. Stakeholders reported that they valued the additional information provided by the 40-day rolling incidence rate.

Discussion

During the increase in the reported number of pertussis cases in 2015, the use of the 40-day rolling incidence was found to be a useful way to visualize surveillance data to illustrate regional and temporal trends in NS. This led to the initiation of an urgent vaccination program in part of a health management zone in response to disease activity.

The increased number of pertussis cases in NS throughout 2015 was concerning as it far exceeded the counts and rates observed on average and in the previous cyclical peak of 2012 (27). This increased activity was successfully described using a 40-day rolling incidence rate.

The use of rolling estimates is not a new technique; rolling averages have been used in other forms of surveillance, such as the development of alert thresholds in syndromic surveillance (28-30). Although rolling averages have been used to set thresholds in other research, this use was not the purpose of the study. An additional benefit of the rolling incidence approach is its potential to define and monitor thresholds of disease occurrence.

There were two main strengths associated with use of the 40-day rolling incidence during this public health event. First, the 40-day rolling average provided a timely visual tool to compare statistics across different subpopulations, using information that was more timely than that provided in monthly notifiable disease reports. These comparisons could not be made using a standard epidemiological curve of case counts. For example, in this event, the increasing trend in the Western Zone was not as obvious from the traditional monthly count, but more evident in the plot of the 40-day rolling average.

Second, use of a 40-day rolling average helped avoid some of the complications associated with reporting small numbers of cases and helped to disentangle the issues behind the steadily rising cumulative rate. Reporting low numbers can also threaten the confidentiality of individuals (19,20) and small numbers are also more affected by chance. This instability can be addressed by either collapsing categories to increase the count (31) or, as in this article, expanding the time interval. NS is a small province with a population of less than one million residents. When pertussis rates are elevated, the actual count of cases remains a small number, especially when stratified by zone.

Limitations

There are several limitations to the 40-day rolling incidence rate. Although this analysis provided disease specific incidence information to public health decision makers, it is a method not traditionally used and thus its results are not comparable to pertussis rates in other jurisdictions. There are few published discussions of incidents where public health interventions for pertussis have been initiated or discontinued using this type of analysis. In New Brunswick, a pertussis outbreak was declared over when activity returned to within two standard deviations of a five year smoothed rolling average for at least two weeks (28) however this is a much larger timeframe than that used in the analysis. The use of communicable periods to define time intervals might provide an indication of current community transmission but does not consider the additional factor of the known cyclical nature of the disease, where peaks can last for several months and recur over a three to five year time span. A longer timeframe may be required to define optimal thresholds for initiating or discontinuing community control interventions. Additionally, since the number of cases is very small, visualization of the data may be distorted. For example, the bimodal characteristic observed in this analysis could be random noise, an artefact of the rolling average process. Therefore, graphics should be interpreted caution when they reflect low counts.

Using episode date is another weakness of this analysis. In NS, the episode date is the date of symptom onset. The definition of episode date may vary across jurisdictions and may reflect date of report, date of lab confirmation or date of symptom onset. As such, the usefulness of comparing rolling incidence across jurisdictions may be limited.

The 40-day time interval might not be the best or most accurate interval to represent the infectious potential of pertussis within NS. The evidence suggests that the longest incubation period could be 42 days (2), thus a 42 day time frame might be a more complete representation of potential communicability. Alternatively, using the average incubation period of 10 days, might also be insightful as to the probable propagation of disease. Additional research and analysis is needed to validate the optimal time interval for reporting moving incidence. Communicability of pertussis depends on the disease stage and whether a patient receives treatment. Cases are most contagious in the catarrhal and early paroxysmal stages (first two weeks), after which communicability gradually decreases over the next three weeks (1,2). Furthermore, cases are no longer contagious after five days of treatment with antibiotics. During this public health event, several cases in families were diagnosed retrospectively. These retrospective cases likely did not benefit from treatment and were therefore probably communicable for longer time intervals. The communicability period was assumed to be the same for all cases included in the 40-day rolling incidence calculations. Cases that received treatment and those that continued to spread the disease were both included. Moreover, delayed reporting of cases limits the real-time effectiveness of this method.

Despite the limitations of the methodology, rolling incidence can be used in conjunction with traditional communicable disease surveillance methods, especially in instances that involve rare public health events, with long incubation periods. There is potential for these methods to be employed in similar situations as they complement traditional epidemiological methods for surveillance of notifiable diseases. Going forward, rolling incidence could be used to define and monitor thresholds of disease occurrence. This will be an area for public health authorities to consider as they continue efforts to improve surveillance for communicable disease. Therefore, graphics should be interpreted with caution when they reflect low counts.

Conclusion

Forty day rolling incidence rates provided a useful way to describe and compare pertussis trends within NS for various geographic levels and age groups. The 40-day rolling incidence rate proved to be a useful supplementary tool to investigate increased pertussis activity and inform the public health decisions of epidemiologists, MOHs and local communicable disease managers. Furthermore, these results helped to guide public health action, particularly in areas of high pertussis activity. The methods presented in this paper could be adjusted to investigate and manage other communicable diseases.

Acknowledgements

The authors acknowledge the local public health staff that collected and reported the data used in the analysis and the stakeholders that provided feedback for this assessment.

Conflict of interest

None.

Funding

This research was supported by the Nova Scotia Department of Health and Wellness and Canadian Field Epidemiology Program.

References

1. Heymann DL. Control of communicable diseases manual, 19th ed. Washington, DC: American Public Health Association; 2008.
2. Public Health Agency of Canada [Internet]. Pertussis (whooping cough) for health professionals. Ottawa, ON: PHAC; 2014 [updated 2014 Feb 21; cited 2015 Aug 9]. Available from: http://www.phac-aspc.gc.ca/im/vpd-mev/pertussis/professionals-professionnels-eng.php.
3. Department of Health and Wellness. Nova Scotia communicable disease manual [Internet]. Halifax, NS: Nova Scotia Department of Health and Wellness; 2001 [cited 2015 Aug 9]. Available from: http://novascotia.ca/dhw/cdpc/cdc/documents/Pertussis.pdf.
4. Gilley M, Goldman RD. Protecting infants from pertussis. Can Fam Phys. 2014 Feb;60(2):138-40.

5. Pimentel AM, Baptista PN, de Alencar Ximenes RA, Rodrigues LC, Magalhães V, Silva AR, Souza NF, Matos DG, Pessoa AK; Pert – Pertussis Study Group. Pertussis may be the cause of prolonged cough in adolescents and adults in the interepidemic period. Braz J Infect Dis. 2015;19(1):43-46.
6. Wood N, McIntyre P. Pertussis: Review of epidemiology, diagnosis, management and prevention. Paed Resp Rev. 2008;(9):201–211.
7. Public Health Agency of Canada. Vaccine coverage in Canadian children: Highlights from the 2013 Childhood National Immunization Coverage Survey (cNICS) [Internet]. Ottawa, ON: PHAC; 2016 [cited 2016 Aug 24]. Available from: http://healthycanadians.gc.ca/publications/healthy-living-vie-saine/immunization-coverage-children-2013-couverture-vaccinale-enfants/alt/icc-2013-cve-eng.pdf.
8. Population Health Assessment and Surveillance. School-based immunization coverage Nova Scotia 2013-2014 [Internet]. Halifax, NS: Nova Scotia Department of Health and Wellness; 2015 [cited 2015 Jul 20]. Available from: http://novascotia.ca/dhw/populationhealth/documents/School-Based-Immunization-Coverage-Nova-Scotia-2013-2014.pdf.
9. Bolotin S, Harvill ET, Crowcroft NS. What to do about pertussis vaccines? Linking what we know about pertussis vaccine effectiveness, immunology and disease transmission to create a better vaccine. Pathog Dis. 2015 Nov 1; 73(8):ftv057.
10. Riolo MA, Rohani P. Combating pertussis resurgence: One booster vaccination schedule does not fit all. Proc Natl Acad Sci USA. 2015 Feb 3;112(5):E472-7.
11. Van Rie A, Hethcote HW. Adolescent and adult pertussis vaccination: Computer simulations of five new strategies. 2004 Aug 13;22(23-24):3154-65.
12. Cornia PB, Hersh AL, Lipsky BA, Newman TB, Gonzales, R. Does this coughing adolescent or adult patient have pertussis? JAMA. 2010 Aug 25;304(8):890-6.
13. Skowronski DM, De Serres G, MacDonald D, Wu W, Shaw C, Macnabb J, Champagne S, Patrick DM, Halperin SA. The changing age and seasonal profile of pertussis in Canada. J Infect Dis. 2002 May 15;185(10):1448-53.
14. Tsang RS, Shuel M, Jamieson FB, Drews S, Hoang L, Horsman G, Lefebvre B, Desai S, St-Laurent M. Pertactin-negative Bordetella pertussis strains in Canada: Characterization of a dozen isolates based on a survey of 224 samples collected in different parts of the country over the last 20 years. Int J Infect Dis. 2014 Nov;28:65-9.
15. Smith T, Rotondo J, Desai S, Deehan H. Pertussis surveillance in Canada: Trends to 2012. Can Comm Dis Rep. 2014; 40(3):21. Available from: http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/14vol40/dr-rm40-03/dr-rm40-03-per-eng.php.
16. Department of Immunizations, Vaccines and Biologicals. WHO-recommended standard for surveillance of select vaccine preventable diseases [Internet]. Geneva: World Health Organization; 2003 [updated 2005 Jul; cited 2016 Aug 28]. Available from: http://apps.who.int/iris/bitstream/10665/68334/1/WHO_V-B_03.01_eng.pdf?ua=1.
17. Government of Canada [Internet]. Notifiable diseases online from Public Health Agency of Canada. Ottawa: Government of Canada; 2016 [updated 2016 Jun 28; cited 2016 Aug 28]. Available from: http://diseases.canada.ca/notifiable/.
18. Doherr MG, Audigé L. Monitoring and surveillance for rare health-related events: A review from the veterinary perspective. Philos Trans R Soc Lond B Biol Sci. 2001 Jul 29;356(1411):1097-106.
19. Statistics Canada. Disclosure control. In Statistics Canada quality guidelines, 4th Ed [Internet]. Ottawa, ON: Statistics Canada; 2003 [updated 2014 April 10; cited 2016 Aug 24]. Available from: http://www.statcan.gc.ca/pub/12-539-x/12-539-x2003001-eng.pdf.
20. National Association of Health Data Organizations. NAHDO-CDC Cooperative Agreement Project. Statistical approaches for small numbers: Addressing reliability and disclosure risk. [Internet] Salt Lake City, UT: The Association; 2004 [updated 2005 April 5; cited 2015 Aug 9]. Available from: https://www.nahdo.org/sites/nahdo.org/files/Data_Release_Guidelines.pdf.
21. Office of the Chief Medical Officer of Health. Pertussis outbreak investigation report [Internet]. Fredericton, NB: New Brunswick Department of Health; 2014 Apr [cited 2015 Aug 9]. Available from: http://www2.gnb.ca/content/dam/gnb/Departments/h-s/pdf/en/CDC/HealthProfessionals/PertussisReport.pdf.
22. Population Health Assessment and Surveillance. Nova Scotia surveillance guidelines for notifiable diseases and conditions: Pertussis [Internet]. Halifax, NS: Nova Scotia Department of Health and Wellness; 2015 [cited 2015 Jul 20]. Available from: http://novascotia.ca/dhw/populationhealth/surveillanceguidelines/pertussis.pdf.
23. Nova Scotia Public Health. Surveillance guidelines. In Application for notifiable disease surveillance (ANDS) Business procedures document [Internet]. Halifax, NS: Nova Scotia Department of Health and Wellness; 2015 [cited 10 Jun 2016]. Available from: http://novascotia.ca/dhw/populationhealth/surveillanceguidelines/ANDS_Business_Procedures.pdf.
24. Stata Corp. Stata statistical software: Release 13 [computer program]. College Station, TX: StataCorp LP; 2013.
25. Statistics Canada [Internet]. CANSIM Table 051-0001 2012-2016 Estimates of population, by age group and sex for July 1, Canada, provinces and territories. Ottawa, ON: Statistics Canada; 2015 [cited 2015 Sep 28]. Available from: http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=0510001&&pattern=&stByVal=1&p1=1&p2=37&tabMode=dataTable&csid.
26. Public Health Agency of Canada [Internet]. National Advisory Committee on Immunization (NACI). Update on pertussis vaccination in pregnancy. Ottawa, ON: The Agency; 2014 [cited 2016 Aug 24]. Available from: http://publications.gc.ca/collections/collection_2014/aspc-phac/HP40-93-2014-eng.pdf.
27. Nova Scotia Health and Wellness. Notifiable diseases in Nova Scotia 2012 surveillance report: Population health assessment and surveillance [Internet]. Halifax, NS: Nova Scotia Department of Health and Wellness; 2013 [cited

2015 Jul 20]. Available from: http://novascotia.ca/dhw/populationhealth/documents/Annual-Notifiable-Disease-Surveillance-Report-2012.pdf.

28. Brown SM, Benneyan JC, Theobald DA, Sands K, Hahn MT, Potter-Bynoe GA, Stelling JM, O'Brien TF, Goldmann DA. Use of binary cumulative sums and moving averages in nosocomial infections cluster detection. Emerg Infect Dis. 2002 Dec;8(12):1426-32.
29. Allard R. Use of time-series analysis in infectious disease surveillance. Bull World Health Organ. 1998;76(4):327-33.
30. Edge VL, Pollari F, Lim G, Aramini J, Sockett P, Martin SW, Wilson J, Ellis A. Syndromic surveillance of gastrointestinal illness using pharmacy over-the-counter sales: A retrospective study of waterborne outbreaks in Saskatchewan and Ontario. Can J Public Health. 2004 Nov-Dec;95(6):446-50.
31. Takiar R, Nadayil D, Nandakumar A. Problem of small numbers in reporting of cancer incidence and mortality rates in Indian cancer registries. Asian Pac J Cancer Prev. 2009 Oct-Dec;10(4):657-60.

ISSUE HIGHLIGHT:
Improving Vaccination Rates

FIND OUT:

- How to improve vaccination rates
- How to address vaccine hesitancy

READ THE ISSUE:
Web Search
CCDR+Vaccination Rates

Canada Communicable Disease Report 2016 readership survey

P Huston[1]*, NM Farrell[2], L Townley[2]

Affiliations

[1] CCDR Editorial Office, Infectious Disease Prevention and Control Branch, Public Health Agency of Canada, Ottawa, ON

[2] Communications and Public Affairs Branch, Health Canada, Ottawa, ON

*** Correspondence:** patricia.huston@phac-aspc.gc.ca

Abstract

Background: The *Canada Communicable Disease Report* (CCDR) is a peer reviewed scientific journal published since 1975. In 2011, a readership survey was conducted to inform a revitalization process. In late 2016, this survey was repeated to assess progress.

Objective: To provide information about the results of the CCDR 2016 readership survey, which identified CCDR's readership and their needs, obtained feedback on the journal's revitalization and sought suggestions for further improvement.

Methods: An online readership survey was conducted from September 7 to 28, 2016. Invitations were sent via email to CCDR subscribers. The survey was based on the 2011 version and checked for face-validity. Analysis included descriptive statistics and a qualitative assessment of comments for themes.

Results: A total of 549 people responded to the survey (12% participation rate). The majority of respondents worked in public health (61%), clinical care (23%), academia (16%) and laboratory medicine (9%). Approximately 45% of respondents had received CCDR for less than four years, which is consistent with the fact that the number of subscribers more than doubled over this time. Over 90% of respondents reported they read the articles in CCDR (always 15%, often 43%, sometimes 35%). When asked about their primary source of infectious disease information in Canada, CCDR was the number one response, identified by 72% of respondents. When asked "What do you like best about CCDR?" typical comments were that it provided Canadian content, was well written, evidence-based, interesting and relevant. The number one suggestion for improvement was that CCDR should be listed with PubMed.

Conclusion: The survey results suggest that CCDR has been successfully revitalized and is meeting its readership's needs for a scientific journal on infectious disease with Canadian content, high quality and relevance. Consistent with suggestions for improvement, CCDR will be joining the PubMed database over the next year.

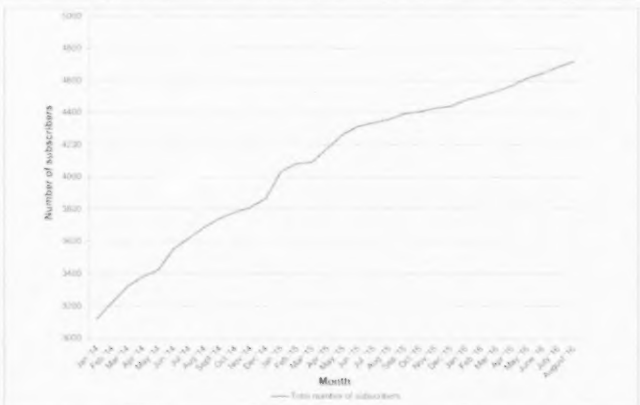
Suggested citation: Huston P, Farrell NM, Townley L. *Canada Communicable Disease Report* 2016 readership survey. Can Commun Dis Rep. 2017;43(2):56-8.

Introduction

The *Canada Communicable Disease Report* (CCDR) is a scientific, peer reviewed, online, bilingual journal that has been in continuous publication since 1975. It was originally published by Health Canada and is now published by the Public Health Agency of Canada (PHAC). In 2011, following a decrease in the publication schedule, a CCDR readership survey was conducted to inform a possible renewal of the journal. At that time CCDR had approximately 2,000 subscribers. Readers noted that CCDR needed to reinvent itself and "bring back timely Canadian communicable disease-relevant articles". The 2011 survey respondents noted they wanted more early reports of outbreaks with potential to spread (95%), national surveillance reports on notifiable diseases (91%) and research articles on infectious disease topics of relevance to Canada (91%) [*unpublished data*].

Following the 2011 survey, the editorial office was re-established and, based on the survey results, CCDR was revitalized and began publishing regular issues with peer reviewed articles in 2013. Its present mandate is to publish timely information on current and emerging infectious diseases of relevance to Canada to inform policy, program development and practice. The number of subscribers more than doubled between the 2011 and 2016 surveys. We have been doing monthly tracking of subscriptions since 2014. (**Figure 1**)

Figure 1: Subscriptions to *Canada Communicable Disease Report*: January 2014–August 2016



In the summer of 2016, the CCDR editorial office worked with Health Canada's Communication and Public Affairs Branch to refine and then repeat the readership survey. The objective of the 2016 survey was to identify CCDR's readership, obtain feedback on the journal post-revitalization and see how it can be further improved. This is a summary of the full *Readership Survey Report (unpublished document, Communications and Public Affairs Branch, Health Canada)*.

Methods

Survey methods were based on the federal government online survey standards (1). The 2016 online survey was based on the 2011 survey and checked for face-validity. It included questions about the readership, how they liked the journal, how they received information on infectious diseases in general and how CCDR might be improved. Most of the survey questions were multiple choice format followed by a comments section which included a question about how to improve CCDR. Following pilot testing in both official languages, an invitation to complete the online survey was sent by email to CCDR's 4716 subscribers.

The survey was available online from September 7 to 28, 2016. Two reminders were sent to non-responders to optimize the participation rate. The participation rate was calculated by dividing the number of responders by the sum of responders, non-responders and the number of bounce-backs minus any email addresses found to be invalid. Analysis of the responses included descriptive statistics and a qualitative assessment of comments for themes.

Results

Canada Communicable Disease Report's readership and information sources

Of the 4716 subscribers, 17 emails were found to be invalid for a total of 4699 participants. Of those 549 surveys were completed for a participation rate of 12%. The majority of respondents indicated they worked in public health (61%), followed by clinical care (23%), academia (16%) and laboratory medicine (9%). This total exceeds 100% because it was possible to select more than one response option (for example, clinical care AND academia). Slightly less than 20% of respondents were 35 years of age or younger, about 40% were between 36-50 years old and 40% were over 50 years old. Almost 50% of respondents had been receiving CCDR for less than four years, which is consistent with the fact that the number of CCDR subscribers doubled since the 2011 survey.

Most readers were from Ontario and Quebec, although there were readers from almost every province and all of the territories, as well as from the United States, the European Union and elsewhere (**Figure 2**). Nearly half of all respondents noted they first heard about CCDR either at a conference or through a colleague or teacher.

The most common resources respondents used to obtain information about infectious diseases were websites (75%), colleagues (72%) and online literature searches (69%). Other sources were noted in the comments such as ProMED. When asked how they were most likely to obtain Canadian-specific information on infectious diseases and immunization, the top source was CCDR (72%), followed by local public health (52%), updates from province/territory (almost 50%) and the National Advisory Committee on Immunization (NACI) (50%) (**Figure 3**).

Figure 2: *Canada Communicable Disease Report*: Readership by location

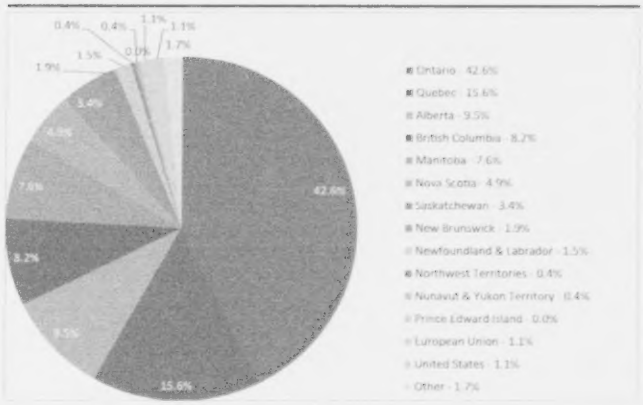


Figure 3: Response to 2016 *Canada Communicable Disease Report* survey question: "How are you most likely to get Canadian-specific information on infectious diseases and immunization (e.g. local outbreak, new vaccine indications)?" (n=549)

CCDR	72.3%
Local Public Health	52.1%
National Advisory Committee on Immunization (NACI)	49.5%
Update from my province or territory	49.4%
Canadian Immunization Guide	45.0%
Canada.ca/health	31.1%
The media	27.1%
Local expert	20.0%
Other	18.8%
No response	2.0%

Feedback on the revitalized *Canada Communicable Disease Report*

Over 90% of respondents reported reading the articles in CCDR (always 15%, often 43%, sometimes 35%) and found the following types of articles to be useful or very useful:

- Rapid communication on outbreaks with potential to spread (90%)
- PHAC or advisory committee guidelines for communicable diseases (87%)
- Research articles on infectious disease topics of relevance to Canada (86%)
- National surveillance reports on notifiable diseases (84%)Comments were provided by 62% of respondents (n=340) in the feedback section.

The most common strengths identified were CCDR's Canadian content, high quality and relevance. When asked "What do you like best about CCDR?" typical comments were: "Canadian, well written, evidence based", "interesting articles", "topical", "relevant to my work", and "concise and reliable."

Suggestions for improvement and next steps

When asked "What do you think is the most important way we can improve CCDR?" almost 50% of respondents commented (n=266). The most frequent comments were: "keep up the good work" and "get indexed on PubMed/Medline". Other suggestions were:

- Reach out to students in universities and give presentations
- Include more foodborne outbreak reports
- Have more articles from authors across Canada
- Be as timely as possible especially with surveillance data and outbreak reports

When asked, 40% of respondents stated they would like to access CCDR using a tablet or smartphone app. However, if an app included CCDR and other resources, such as the *Canadian Immunization Guide*, the *Sexually Transmitted Infection Guide* and the *Tuberculosis Standards*, 46% of respondents stated they would download it. A typical comment was "I would like to be able to access CCDR from my iPhone."

Discussion

CCDR readers come from across Canada and around the world. Most respondents work in public health and clinical care. Readers like the CCDR's revitalized content, high quality and relevance and identify the journal as their top source for Canadian-specific infectious disease information. In 2011, CCDR readers asked for more rapid communications, summaries of advisory committee recommendations and research articles on infectious diseases. These types of articles have been published in CCDR over the last three years and 85–90% of readers have found them useful.

Since CCDR was revitalized, its subscription rate has more than doubled. Survey responders suggested more outreach, Canadian authors, increased timeliness and a mobile application. However, the most common suggestion for improvement was to list the journal with PubMed.

The key limitation of this survey is the response rate of 12%. Although this is not unusual for an online survey, there is no assurance that the respondents are representative of the entire CCDR readership.

The readership survey confirms that CCDR has come a long way in the past five years and its readers find it to be their go-to source for practical, authoritative information on infectious diseases in Canada. We are pleased to announce that CCDR has passed the scientific review for PubMed and full text articles will be available through PubMed Central in 2017.

Contributors

Many thanks to the following people who assisted in the development of the survey and this article:

- Lidiya Tsegaye assisted with drafts of survey instrument
- Kyla Tyson provided the subscription data, conducted the analysis of survey comments and developed the initial draft of manuscript
- Mylène Poulin provided input on initial drafts of the survey instrument and drafts of the manuscript

Acknowledgements

Many thanks to all CCDR's contributors and to all the respondents of the CCDR survey.

Conflict of interest

Dr. Patricia Huston is the Editor-in-Chief of CCDR and recused herself from editorial decisions regarding this manuscript. The Associate Editor, Dr. Hilary Robinson, made the editorial decisions on this manuscript.

Funding

The CCDR is supported financially by PHAC.

Reference

1. Public Services and Procurement Canada. Standards for the conduct of Government of Canada public opinion research – online surveys [Internet]. Ottawa (ON): Government of Canada; [updated 2014 Nov 19; cited 2017 Jan 10]. Available from: https://www.tpsgc-pwgsc.gc.ca/rop-por/enligne-online-eng.html#s8.

NOTICE

Interim Canadian Recommendations for the use of fractional dose of yellow fever vaccine during a vaccine shortage: Now in effect

Committee to Advise on Tropical Medicine and Travel (CATMAT)[1]*

Affiliation

[1] Travel Health, Public Health Agency of Canada, Ottawa, ON

*** Correspondence:** CATMAT.Secretariat@phac-aspc.gc.ca

Suggested citation: Committee to Advise on Tropical Medicine and Travel. Interim Canadian Recommendations for the use of fractional dose of yellow fever during a vaccine shortage: Now in effect. Can Commun Dis Rep. 2017;43(2):59.

The licensed marketer of the yellow fever vaccine in Canada is experiencing a supply issue for the Yellow Fever vaccine licenced for use in Canada. In an effort to manage the supply shortage, the manufacturer is rationing vaccine to designated Yellow Fever Vaccine Centres, currently fulfilling orders at approximately 50% of the normal requirement. A return to normal supply is only anticipated in late 2018. As a result, some rationing is expected to continue until that time.

To minimize the impact of the shortage, the Public Health Agency of Canada is continuing to work with the manufacturer to ensure that limited supplies of vaccine are equitably distributed across the country.

Given the current yellow fever vaccine shortage in Canada, the Public Health Agency of Canada encourages health care practitioners to refer to the Interim Canadian recommendations for the use of fractional dose of yellow fever vaccine during a vaccine shortage (1) developed by the Committee to Advise of Tropical Medicine and Travel (CATMAT). The statement outlines interim recommendations intended for use during a yellow fever vaccine shortage, which differ from the standard recommendations for yellow fever vaccination in the *Canadian Immunization Guide*, and in the Committee to Advise on Tropical Medicine and Travel (CATMAT) Statement for Travellers and Yellow Fever.

Reference

1. Yellow Fever Working Group on behalf of the Committee to Advise on Tropical Medicine and Travel (CATMAT). Interim Canadian Recommendations for the use of a fractional dose of yellow fever during a vaccine shortage. Can Commun Dis Rep. 2016;42(8):158-60. Available from: http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/16vol42/dr-rm42-8/ar-02-eng.php.

Recommendations on the prevention and treatment of Zika virus for Canadian health care professionals: 3rd update

Source: Committee to Advise on Tropical Medicine and Travel (CATMAT). Recommendations on the Prevention and Treatment of Zika virus for Canadian health care professionals. January 16, 2017. Available from: http://healthycanadians.gc.ca/publications/diseases-conditions-maladies-affections/committee-statement-treatment-prevention-zika-declaration-comite-traitement-prevention/index-eng.php?_ga=1.154058232.1718591151.1469533975.

The Committee to Advise on Tropical Medicine and Travel (CATMAT) recently released the third update of the Recommendations on the prevention and treatment of Zika virus for health care professionals. The document summarizes the current evidence related to Zika virus (ZIKV) and provides guidance to health care professionals on infection prevention and patient disease management. Recommendations continue to focus on the importance of mosquito bite prevention when travelling to areas of risk and secondary infection through sexual transmission. As ZIKV infection can cause microcephaly and other congenital abnormalities, specific recommendations are outlined for pregnant women and those planning a pregnancy.

Updates to the document include:

- new information related to guidance specific to infants with suspected or confirmed congenital Zika syndrome; and
- expanded details in the sections on prevention of sexual transmission, laboratory diagnosis and screening and management.

Use of motion comics for STI education

Source: Willis LA, Kachur R, Castellanos TJ, Spikes P, Gaul ZJ, Gamayo AC, Durham M, Jones S, Nichols K, Han Barthelemy S, LaPlace L, Staatz C, Hogben M, Robinson S, Brooks JT, Sutton MY. Developing a motion comic for HIV/STD prevention for young people ages 15-24, Part 1: Listening to your target audience. Health Commun. 2016 Dec 21:1-10. doi: 10.1080/10410236.2016.1255840. [Epub ahead of print]. Available from: http://www.tandfonline.com/doi/abs/10.1080/10410236.2016.1255840.

Young people (15-24 years) in the United States are disproportionately affected by infection with human immunodeficiency virus (HIV) and sexually transmitted diseases (STD). Shortfalls in HIV/STD-related knowledge, attitudes, beliefs, and behavioral intentions (KABI) likely contribute to this discrepancy. In this report we describe our experience developing a novel means of health communication combining entertainment-education theory and recent technological advances to create a HIV/STD-focused "motion comic." We also report the audience satisfaction and acceptance of the intervention. We used the Health Belief Model (HBM), entertainment-education (EE) principles, and the Sabido Method (SM) and conducted three rounds of focus groups to develop a 38-minute HIV/STD focused motion comic for young people between the ages 15 and 24 years. Participants indicated that motion comics were an acceptable method of delivering HIV/STD prevention messages. They also expressed satisfaction with motion comics plot, story settings, the tone of humor, and drama. Our results suggest that motion comics are a viable new method of delivering health communication messages about HIV/STD and other public health issues, and warrant further development and broader evaluation.

Authors' corrections for Can Commun Dis Rep. 2016;42(11)

M Ebrahim[1], D Gravel[1]*, C Thabet[1], K Abdesselam[1], S Paramalingam[1], C Hyson[1]

Affiliation

[1] Centre for Communicable Diseases and Infection Control, Public Health Agency of Canada, Ottawa, ON

*** Correspondence:** denise.graveltropper@phac-aspc.gc.ca

Suggested citation: Ebrahim M, Gravel D, Thabet C, Abdesselam K, Paramalingam S, Hyson C. Correction for Can Commun Dis Rep. 2016;42(11). Can Commun Dis Rep. 2017;43(2):61.

In the article "Antimicrobial use and antimicrobial resistance trends in Canada: 2014" (1) (http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/16vol42/dr-rm42-11/ar-02-eng.php) by Ebrahim M et al published on November 3, 2016, the following corrections were made on February 2, 2017 upon the request of the authors:

1. In the Results, in the "Antibiotic use" section, under the sub-heading "Usage in food production animals" the following two sentences:

   "Due to a new indication for use for fluoroquinolone in animals, the quantity of fluoroquinolones distributed increased by 14% between 2013 and 2014. However there has been an overall 40% increase since 2010."

   were changed to:

   "Since 2010 there has been a 40% increase in the quantity of fluoroquinolones distributed for use in animals, likely due in part to the approval of a new indication for fluoroquinolone use. Between 2013 and 2014, the quantity increased by 14%."

2. At the end of the Acknowledgements the following sentence was added:

   The authors would also like to acknowledge with thanks the Canadian Antimicrobial Resistance Surveillance System (CARSS) team for the creation of materials and Figures used in this summary.

Reference

1. Ebrahim M, Gravel D, Thabet C, Abdesselam K, Paramalingam S, Hyson C. Antimicrobial use and antimicrobial resistance trends in Canada: 2014. Can Commun Dis Rep. 2016;42(11):227-31. Available from: http://www.phac aspc.gc.ca/publicat/ccdr-rmtc/16vol42/dr-rm42-11/ar-02-eng.php.

CCDR correction for Can Commun Dis Rep. 2017;43(1)

Canada Communicable Disease Report Editorial team[1]*

Affiliation

[1] CCDR Editorial Office, Infectious Disease Prevention and Control Branch, Public Health Agency of Canada Ottawa, ON

***Correspondence:** ccdr-rmtc@phac-aspc.gc.ca

Suggested citation: Canada Communicable Disease Report Editorial team. Correction for Can Commun Dis Rep. 2017;43(1). Can Commun Dis Rep. 2017;43(2):61.

In the Editorial Policy article "Information for Authors: 2017" (1) (http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/17vol43/dr-rm43-1/ar-06-eng.php) published on January 5, 2017, the following correction was made on February 2, 2017:

1. In "The editorial and production process" section, under the sub-heading "Assessment and revision", the sentence:

   "Manuscripts that have been correctly submitted are screened by the editorial team for appropriateness and assessed with iThenticate[12] software for redundancy."

   was changed to:

   "Manuscripts that have been correctly submitted are assessed by the editorial team for appropriateness and will soon be routinely screened with antiplagiarism software."

   and footnote 12 was removed.

Reference

1. Canadian Communicable Disease Report Editorial Office. Information for Authors: 2017. Can Commun Dis Rep. 2017;43(1):32-4. Available from: http://webqa.phac-aspc.gc.ca/publicat/ccdr-rmtc/17vol43/dr-rm43-1/ar-06-eng.php.

CCDR

CANADA COMMUNICABLE DISEASE REPORT

Public Health Agency of Canada
130 Colonnade Road
Address Locator 6503B
Ottawa, Ontario K1A 0K9
ccdr-rmtc@phac-aspc.gc.ca

To promote and protect the health of Canadians through leadership, partnership, innovation and action in public health.

Public Health Agency of Canada

Published by authority of the Minister of Health.

© Her Majesty the Queen in Right of Canada, represented by the Minister of Health, 2016

This publication is also available online at

http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/17vol43/index-eng.php

Également disponible en français sous le titre :
Relevé des maladies transmissibles au Canada